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FINAL SAMPLING AND ANALYSIS PLAN ADDENDUM NUMBER 2 NAS BRUNSWICK ME

8/1/2011

CH2M HILL

Final Sampling and Analysis Plan Addendum No. 02

Topsham Annex Site – Buildings 378, 338, 1099 & 1114 Skeet Range Debris Area (TOP 1) and Topsham Annex Debris Area (TOP 2) Topsham Annex

Naval Air Station Brunswick Brunswick, Maine

Revision No. 00

Contract No. N62470-08-D-1006 Task Order No. WE01

Submitted to:

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic Division

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Acronyms and Abbreviations

AGVIQ-CH2M HILL	AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III
ASTM	American Society for Testing and Materials
bgs	below ground surface
CSO	Caretaker Site Office
DPT	direct-push technology
DRO	Diesel Range Organic
EA	EA Science and Technology
EM	electromagnetic
EPH	extractable petroleum hydrocarbons
GPR	ground penetrating radar
GPS	global positioning system
GRO	Gasoline Range Organic
Hz	hertz
MEC	munitions and explosives of concern
MEDEP	Maine Department of Environmental Protection
NAS	Naval Air Station
NEX	Naval Exchange
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
TAL	target analyte list
TASKT	Topsham Annex Skeet Range
TPH	total petroleum hydrocarbons
VPH	volatile petroleum hydrocarbons

1.0 Introduction

AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III (AGVIQ-CH2M HILL) has been contracted by the Naval Facilities Engineering Command, Mid-Atlantic (NAVFAC MIDLANT) to prepare this Sampling and Analysis Plan (SAP) Addendum No. 2 under Remedial Action Contract No. N62470-08-D-1006, Task Order (TO) No. WE01. The purpose of this SAP Addendum is to describe the procedures to be used to determine residual contamination of total petroleum hydrocarbons (TPH) contamination in soil, perform one round of groundwater sampling at the former Topsham Annex Site, and investigate two debris areas prior to an anticipated soil removal action at one of the areas namely, the Topsham Annex Skeet Range (TASKT) at former Topsham Annex in Topsham, Maine.

The objectives of this Sampling Analysis Plan (SAP) Addendum No. 2 are to determine whether risk still remains related to exceedance of the new MEDEP criteria for petroleum in soils or groundwater at Buildings 338, 378, 1099, and 1114 from residual contamination left in place during the soil removal actions performed in 2006 by Tetra Tech EC, Inc. Additionally, two areas identified as "waste disposal areas" (Skeet Range Debris Area and Topsham Annex Debris Area) will be investigated utilizing an electromagnetic (EM) survey and subsequent test pitting if results of the EM survey require additional investigation. The purpose of the EM survey and subsequent test pitting is to determine the extent and type of potentially buried debris at the two debris areas that could potentially pose a risk. The scope of work includes: 1) placement of 7 boreholes for soil sampling and analysis; 2) installation, development, and one round of sampling and analysis of 11 flush-mount 1-inch monitoring wells using 5 feet of PrePak well screens; 3) performing EM survey at the two waste disposal areas; 4) conducting test pits (approximately 10 feet long by 2 feet wide and 8 feet deep) at the two waste disposal areas depending on the results of the EM survey; and 5) waste management.

AGVIQ-CH2M HILL intends this document to be a site-specific guide for use by the field team while performing the sampling and analysis. This scope of work has been prepared to determine if soil remaining in place subsequent to the 2006 limited soil removal at Buildings 338, 378, 1099, and 1114 pose a risk and to determine the existence and type of debris within the two potential debris areas.

The approved SAP of September 2008 included groundwater sampling and installation of monitoring wells at the former Navy Exchange (NEX) Service Station Site located at NAS Brunswick (AGVIQ-CH2M HILL, 2008). AGVIQ-CH2M HILL will use the original SAP to follow appropriate Quality Assurance/Quality Control (QA/QC) procedures and necessary Health and Safety requirements. Health and Safety requirements for test pit excavation activities will follow the Health and Safety Plan prepared in September 2009 for the soil removal activities at the former NEX Service Station Site (AGVIQ-CH2M HILL, 2009). In addition, laboratory QA/QC protocols will be in accordance with the Tetra Tech EC, Inc. (Tetra Tech) document "*Final Work Plan for TPH Soil Remediation and Investigation Activities*"(Tetra Tech, 2006) and will utilize the most current Maximum Exposure Guidelines (MEGs) and Soil Remedial Action Guidelines (RAGs).

This SAP Addendum No. 2 is organized into the following five sections and two appendices:

Section 1.0 Introduction includes the project objectives and overall scope of work for this.

Section 2.0 Site Background provides a brief description of the areas of concern investigated as part of this SAP Addendum.

Section 3.0 Scope of Work provides sample locations, sampling frequency, and the required laboratory analyses for samples. Procedures outlining sample collection, sample handling, labeling, and required QA/QC samples are included in this section. Additionally, procedures for EM survey and test pit investigation are discussed in this section. A brief summary of waste management, surveying, and project schedule are provided in this section.

Section 4.0 Technical Memorandum and Recommendations indicates that data from this field investigation will be evaluated and recommendations for future work will be provided in a technical memorandum.

Section 5.0 References includes references to documents used to prepare this SAP Addendum No. 02.

Appendix A contains the Maine Department of Environmental Protection (MEDEP) SOP - Compendium of Field Testing of Soil Samples for Gasoline and Fuel Oil; and **Appendix B** contains MEDEP Draft SOP – Field Testing of Soil Samples for Fuel Oils Utilizing Oleophilic Dye Shake Test.

TABLE 1-1
Proposed Sampling and Analysis
Topsham Site, NAS Brunswick

Sample Point	Sample Matrix	Sampling Frequency	Approx. Number of Samples	Sampling Method	Sampling Equipment	TAT	Data Package Requirement	Required Analysis	Analytical Method	Holding Time	Sample Preservation	Containers
Area A - Buildings 337 & 338												
Groundwater Interface and/or a soil sample exhibiting elevated (>50ppm) PID readings above the groundwater interface	Soil	Once	1 + 1 Field Duplicates =2 TOTAL	Grab using DPT	Polyethylene Liner	7 days	AGVIQ-CH2M HILL Level C	EPH	MA EPH	14 days/40 days	Cool to 4°C	4 oz soil jar
								VPH	MA VPH	28 days	5 mL MeOH; Cool to 4°C	(2) 40 ml vial
Monitoring Wells (3 new wells)	Groundwater	Once	3 + 1 Field Duplicate + 1 MS/MSD = 6 TOTAL	Grab	Low Flow Sampling Method	7 days	AGVIQ-CH2M HILL Level C	EPH	MA EPH	7 days ext; 40 days analysis	HCl pH< 2; Cool to 4°C	(2)1 L amber glass
								VPH	MA VPH	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
Area C - Building 378												
Groundwater Interface and/or a soil sample exhibiting elevated (>50ppm) PID readings above the groundwater interface	Soil	Once	2 + 1 MS/MSD =3 TOTAL	Grab using DPT	Polyethylene Liner	7 days	AGVIQ-CH2M HILL Level C	EPH	MA EPH	14 days/40 days	Cool to 4°C	4 oz soil jar
								VPH	MA VPH	28 days	5 mL MeOH; Cool to 4°C	(2) 40 ml vial
Monitoring Wells (4 new wells)	Groundwater	Once	4 TOTAL	Grab	Low Flow Sampling Method	7 days	AGVIQ-CH2M HILL Level C	EPH	MA EPH	7 days ext; 40 days analysis	HCl pH< 2; Cool to 4°C	(2)1 L amber glass
								VPH	MA VPH	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
Area E - Building 1099												
Groundwater Interface and/or a soil sample exhibiting elevated (>50ppm) PID readings above the groundwater interface	Soil	Once	2+ 1 Field Duplicates =2 TOTAL	Grab using DPT	Polyethylene Liner	7 days	AGVIQ-CH2M HILL Level C	EPH	MA EPH	14 days/40 days	Cool to 4°C	4 oz soil jar
								VPH	MA VPH	28 days	5 mL MeOH; Cool to 4°C	(2) 40 ml vial
Monitoring Wells (2 new wells)	Groundwater	Once	2 TOTAL	Grab	Low Flow Sampling Method	7 days	AGVIQ-CH2M HILL Level C	EPH	MA EPH	7 days ext;	HCl pH< 2;	(2)1 L amber
								VPH	MA VPH	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
Area E - Building 1114												
Groundwater Interface and/or a soil sample exhibiting elevated (>50ppm) PID readings above the groundwater interface	Soil	Once	2 TOTAL	Grab using DPT	Polyethylene Liner	7 days	AGVIQ-CH2M HILL Level C	EPH	MA EPH	14 days/40 days	Cool to 4°C	4 oz soil jar
								VPH	MA VPH	28 days	5 mL MeOH; Cool to 4°C	(2) 40 ml vial
Monitoring Wells (2 new wells)	Groundwater	Once	2 + 1 Field Duplicates =3 TOTAL	Grab	Low Flow Sampling Method	7 days	AGVIQ-CH2M HILL Level C	EPH	MA EPH	7 days ext;	HCl pH< 2;	(2) 1 L amber
								VPH	MA VPH	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
Skeet Range Debris Area												
Bottom of test pit	Soil	Once	TBD based on visual observations and PID readings	Composite 4 random grabs into 1 sample (except for VOCs; it should be a grab sample using an Encore® sampler or equivalent from the location with highest PID readings)	Excavation bucket into ziploc bag to composite. Encore® sampler or equivalent for VOCs.	21 days	AGVIQ-CH2M HILL Level C	VOCs	8260B	14 days	HCl pH< 2; Cool to 4°C	(3) 40 ml vial
						21 days		PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	8 oz amber glass
						21 days		Semi-Volatiles	8270C	14 day extr; 40 day analysis	Cool to 4°C	4 oz glass
						21 days		EPH	MA EPH	14 day extr; 40 day analysis	Cool to 4°C	4 oz. glass
						21 days		VPH	MA VPH	28 days	5 mL MeOH; Cool to 4°C	(2) 40 ml vial

TABLE 1-1
Proposed Sampling and Analysis
Topsham Site, NAS Brunswick

Sample Point	Sample Matrix	Sampling Frequency	Approx. Number of Samples	Sampling Method	Sampling Equipment	TAT	Data Package Requirement	Required Analysis	Analytical Method	Holding Time	Sample Preservation	Containers
Topsham Annex Debris Area												
Bottom of test pit	Soil	Once	TBD based on visual observations and PID readings	Composite 4 random grabs into 1 sample (except for VOCs; it should be a grab sample using an Encore® sampler or equivalent from the location with highest PID readings)	Excavation bucket into ziploc bag to composite. Encore® sampler or equivalent for VOCs.	21 days	AGVIQ-CH2M HILL Level C	VOCs	8260B	14 days	HCl pH< 2; Cool to 4°C	(3) 40 ml vial
						21 days		PCBs	8082	14 day extr; 40 day analysis	Cool to 4°C	4 oz glass
						21 days		Semi-Volatiles	8270C	14 day extr; 40 day analysis	Cool to 4°C	4 oz glass
						21 days		EPH	MA EPH	14 day extr; 40 day analysis	Cool to 4°C	4 oz glass
						21 days		VPH	MA VPH	28 days	5 mL MeOH; Cool to 4°C	(2) 40 ml vial
Soil Characterization Sampling - Disposal of IDW Waste												
From 55-gal drums	Soil	Once	1	Composite 4 random grabs into 1 sample	SS spoon, SS bowl	21 days	AGVIQ-CH2M HILL Level B	TCLP Volatiles	1311/8260B	14 day TCLP extr; 14 day analysis	Cool to 4°C	(1) 4 oz amber glass
								TCLP Semi-Volatiles	1311/8270C	14 day TCLP extr; 7 day extr; 40 day analysis		(4) 8 oz amber glass
								TCLP Metals	1311 / 6010A / 7470	6 month TCLP extr; 6 month analysis Hg: 28 day TCLP extr; 28 day analysis		
								TCLP Pesticides	1311/8081A	14 day TCLP extr; 7 day extr; 40 day analysis		
								TCLP Herbicides	1311/8151A	14 day TCLP extr; 7 day extr; 40 day analysis		
								PCBs	8082	14 day extr; 40 day analysis		
								Corrosivity	9045a	ASAP		
								Ignitability	1010/1020	ASAP		
Liquid Characterization Sampling -Disposal of IDW Waste												
From 55-gal drums	Water	Once	1	Grab	Drum thief or dip jar	21 days	AGVIQ-CH2M HILL Level B	TCL Volatiles	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
								TCL Semi-volatiles	8270C	7 days ext; 40 days analysis	Cool to 4°C	(4) 1L amber glass
								TCL Pesticides	8081A	7 days ext; 40 days analysis		
								TCL Herbicides	8151A	7 day extr; 40 day analysis		
								PCBs	8082	7 day extr; 40 day analysis		(2) L amber glass
								TAL Metals	6010B/7470A	180 days; Hg=28 day	HNO3 pH< 2; Cool to 4°C	(1) 500 mL HDPE
								Ignitability	1010	ASAP	Cool to 4°C	(1) 250 mL amber glass
								Corrosivity	9040B	ASAP		(1) 250 mL amber glass

2.0 Site Background

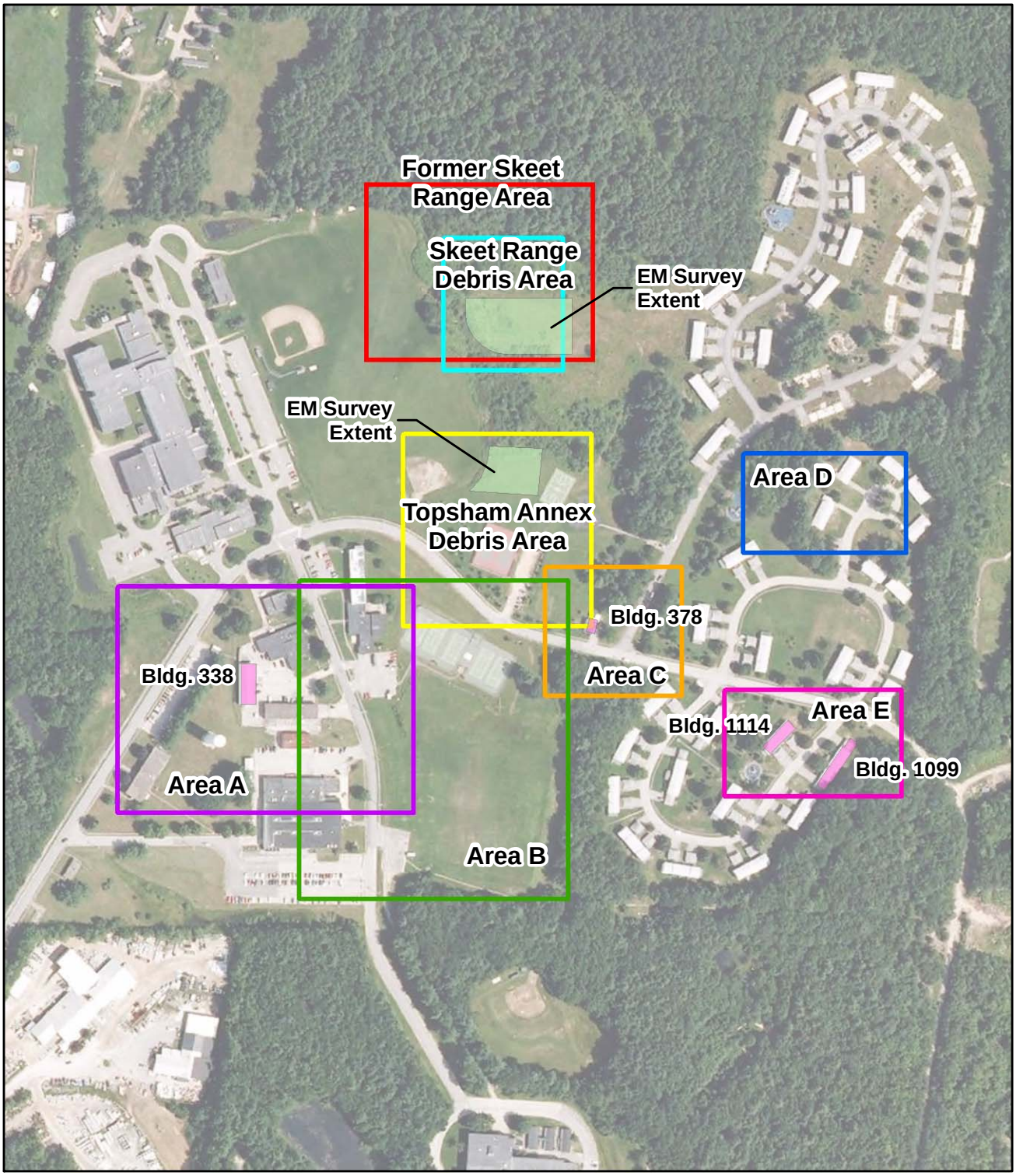
The areas of concern addressed in this SAP Addendum No. 2 for additional investigation activities are located at the former Topsham Annex for NAS Brunswick in Topsham, Maine (Figure 2-1). Based on review of the data from the 2004 and 2006 investigations with the Navy and MEDEP recently, areas at the Topsham Annex that are relevant to this SAP include:

- Building 338: Former automotive storage and repair
- Building 378: Former housing maintenance shop
- Building 1099 (currently 233 to 239 Parliament Circle): Residential housing
- Building 1114 (currently 238 to 244 Parliament Circle): Residential housing
- TOP-01: Filled area (referred to herein as the Skeet Range Debris Area)
- TOP-02: Former oil/water separator and debris area (referred to herein as the Topsham Annex Debris Area)

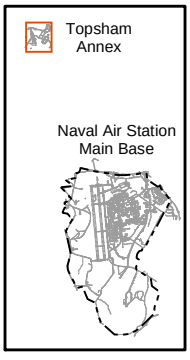
In 2004, investigation activities were conducted by EA Science and Technology (EA) at select locations throughout the Topsham Annex, which included the above listed areas. EA advanced soil borings at each location to determine the extent of TPH contamination (select buildings and debris areas), metals (specifically debris areas), and polychlorinated biphenyls (PCBs, debris areas only). Groundwater and soil samples were collected from select intervals.

Based on the 2004 results, Tetra Tech selected areas for limited soil removal actions in 2006. Of the above mentioned properties, soil removal occurred at Building 338, 1099, and 1114. Excavations generally correlated to previous underground storage tanks and oil/water separator locations, and residual surrounding impacts.

An site investigation was completed to assess the munitions constituents at the TASKT site (Tetra Tech NUS, Inc., 2011). TASKT is located in the northern portion of the Topsham Annex, approximately 4 miles north of the NAS Brunswick Main Base, in Topsham, Maine. The property is not part of the NAS Brunswick National Priorities List site. The skeet range is a 29-acre area that was formerly used by the Air Force during the 1970s, 27 acres of which is on private property. Lead shot from expended shotgun ammunition is not considered munitions and explosives of concern (MEC); therefore, the skeet range is not suspected to contain MEC (Tetra Tech NUS, Inc., 2011). Shallow and deep surface soil, surface water, and sediment samples were submitted for laboratory analysis of total analyte list (TAL) metals and polynuclear aromatic hydrocarbons (PAHs). In addition, a subset of sediment samples was analyzed for pH, total organic carbon, and cation exchange capacity. The results of this investigation indicated that shallow surface soil (0 to 3 inches below ground surface [bgs]) is contaminated with arsenic, lead, and PAHs, and one area of deep surface soil (3 inches bgs and greater) is contaminated with manganese. Deep surface soil (with the exception of the area noted above), surface water, and sediment concentrations were found to be within acceptable levels of risk-based residential criteria. A separate work plan is being prepared to complete a soil removal action for lead and PAH contamination at the TASKT site.



VICINITY MAP



LEGEND

- EM Survey Extent
- Building of Concern

Area of Investigation

- Area A
- Area B
- Area C
- Area D
- Area E
- Former Skeet Range Area
- Skeet Range Debris Area
- Topsham Annex Debris Area

N

0 200 400

Feet

FIGURE 2-1
Site Layout and Locations of Areas of Concern
Topsham Annex
Naval Air Station Brunswick
Topsham, Maine

3.0 Scope of Work

The objectives of this Sampling Analysis Plan (SAP) Addendum No. 2 are to determine whether risk still remains related to exceedance of the new MEDEP criteria for petroleum in soils or groundwater at Buildings 338, 378, 1099, and 1114 from residual contamination left in place during the soil removal actions performed in 2006 by Tetra Tech EC, Inc. Additionally, two areas identified as "waste disposal areas" (Skeet Range Debris Area and Topsham Annex Debris Area) will be investigated utilizing an electromagnetic (EM) survey and subsequent testing pitting if results of the EM survey require additional investigation. The purpose of the EM survey and subsequent test pitting is to determine the extent and type of potentially buried debris at the two debris areas that could potentially pose a risk.

AGVIQ-CH2M HILL intends this document to be a site-specific guide for use by the field team while performing the sampling and analysis. This scope of work has been prepared determine if soil remaining in place subsequent to the 2006 limited soil removal at Buildings 338, 378, 1099, and 1114 pose a risk and to determine the existence and type of debris within the two potential debris areas. The following subsections present the details of the proposed work to evaluate the necessary objectives for the site.

3.1 Mobilization and Site Setup

A pre-construction/coordination and mutual understanding meeting will be held with the NAS Brunswick Caretaker Site Office (CSO) at the site prior to commencement of any intrusive work. Prior to the commencement of field work, AGVIQ-CH2M HILL will coordinate with Maine Dig Safe (1-888-DIG-SAFE) and the CSO to complete a site utility survey, acquire utility layout plans, and complete the dig permit. Additionally, a third-party utility clearance subcontractor will also be utilized to identify all utilities in the work area. Identified utilities in the work areas will be marked with paint and stakes, as appropriate. Staff onsite will be made aware of any overhead utilities that may affect the boom of the drill rig and the excavator. In addition, the progress of drilling work and excavation activities will be continuously monitored for evidence of any obstructions. Any damage to underground or overhead utilities and/or subsurface structures will be immediately reported to the CSO and subsequently repaired by AGVIQ-CH2M HILL via methods approved by the CSO.

3.2 Soil Sampling

Direct-push technology (DPT) boreholes will be advanced within the Topsham Annex at the specific characterization areas. All borings will be advanced to the upper limits of the blue/gray marine clay layers (estimated to be approximately 15 feet bgs). Based on recent discussions with Navy and MEDEP, a total of 11 locations are proposed site-wide with 7 of the locations being sampled and all 11 locations being converted into monitoring wells (refer below for specific locations). In general, soil borings will be completed by targeting the edges of the known Diesel Range Organic (DRO) and Gasoline Range Organic (GRO)

plumes horizontally to better delineate the plume and determine if the 2006 limited removal action was successful. If elevated photoionization detector (PID) readings are observed (greater than 100 parts per million [ppm]), additional step-outs may be necessary and will be determined through discussions with the Project Team.

Continuous cores will be collected within each boring to the prescribed depth. Borings will be advanced until the blue-gray marine clay is observed (anticipated to be approximately 15 feet below land surface). Soil borings will be logged by field personnel according to American Society of Testing and Materials (ASTM) D 2488-84, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Sampling equipment will be decontaminated between each sample location and depth.

Headspace measurements will be performed continuously at 2-foot intervals (or as applicable, based on field conditions) to the entire depth of each borehole for health and safety reasons. Headspace measurements will be completed using a 11.7 eV PID in accordance with MEDEP petroleum field sampling procedures SOP TS004. A copy of this procedure is included in Appendix A. In addition to headspace measurements, based on field conditions and using professional judgment, a petroleum soil-water shake test (Cheiron Resources, Ltd. product or equivalent) will be performed at every borehole above the water table and/or at the soil and groundwater interface. Field conditions which may require soil-water shake tests includes, but is not limited to, petroleum odor, staining, and/or discoloration. Soil-water shake tests will be performed and in accordance with MEDEP Draft SOP TS005 (Appendix B).

At seven of the locations and dependent on corrected PID readings (Figures 3-1 to 3-3), soil samples will be collected from the groundwater interface and/or from soil above the groundwater interface exhibiting readings of greater than 50 ppm. Selected soil samples collected from each of the boreholes will be placed in containers specified in Table 1-1. The soil samples will be analyzed at a laboratory accredited by the Department of Defense Environmental Laboratory Accreditation Program and approved by MEDEP. Samples will be analyzed for extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) (MADEP, 2004). Because the data are required as soon as possible to facilitate transfer of the property, samples will be placed on a turnaround time (TAT) of 7 days to expedite results.

Soil samples from each location are listed below:

- Building 338: One soil sample location is proposed on the northwest side of the 2006 excavation to determine if residual DRO contamination exists (Figure 3-1).
- Building 378: Two soil sample locations are proposed in the vicinity of the former location of an oil/water separator. Samples are to determine if residual dissolved phase DRO contamination exist downgradient of the former oil/water separator (Figure 3-2).
- Building 1099: Two soil sample locations are proposed along the northwest corner of Building 1099 and within Parliament Circle to determine residual DRO impacts based on the 2004 investigation (and subsequent 2006 limited removal action) (Figure 3-3).

- Building 1114: Two soil sample locations are proposed in and around the carports on the east side of building 1099 to determine if any residual DRO impacts remain from the former underground storage tank (Figure 3-3).

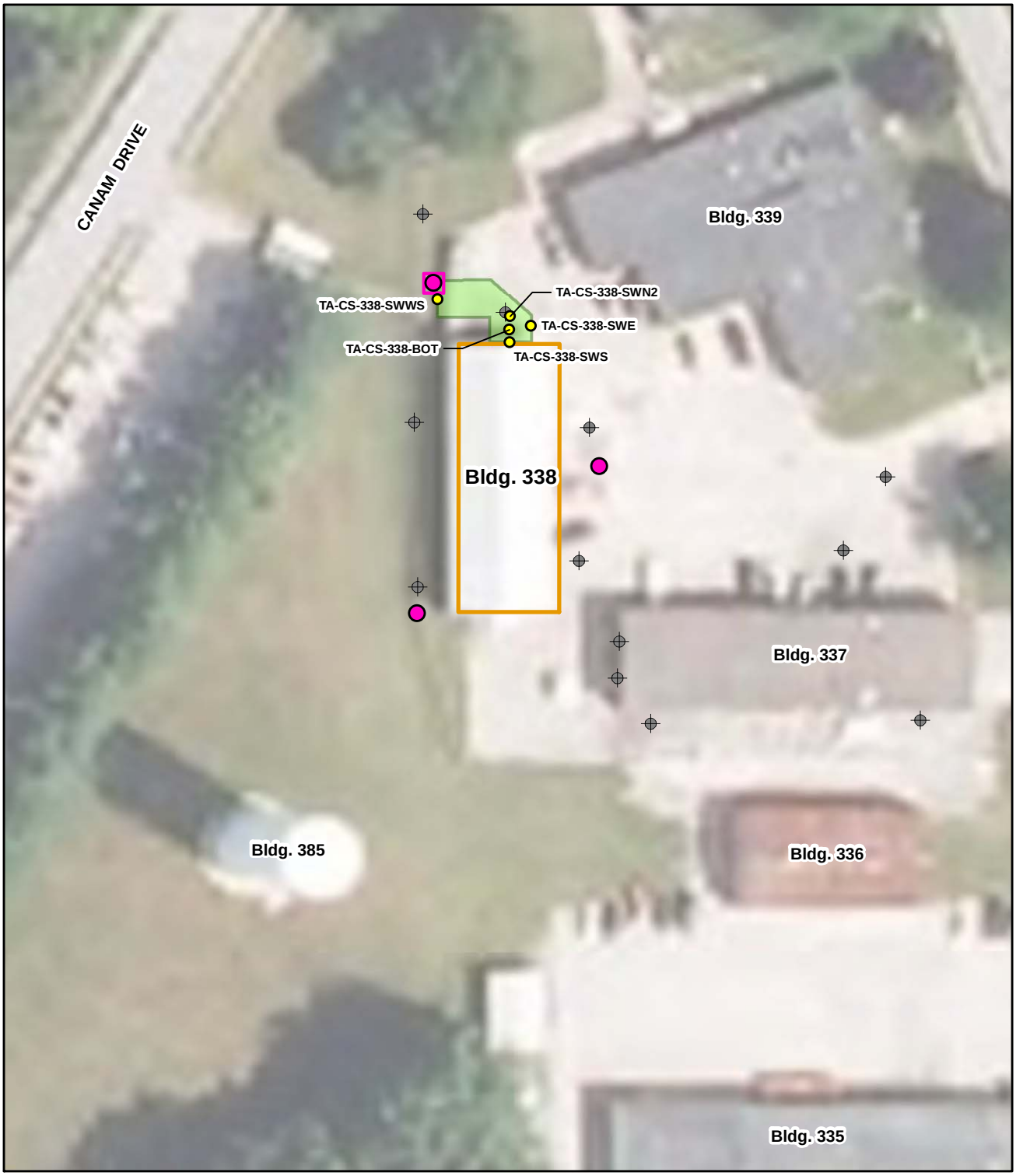
3.3 Well Installation and Sampling

Subsequent to advancement of soil borings, newly installed flush-mount 1-inch monitoring wells will be completed using 5 feet of PrePak well screens. The PrePak well screens will consist of a sand pack over a 0.010-inch slot size polyvinyl chloride (PVC) screen. Additional sand will be placed around the exterior of the PrePak well screen to minimize any infiltration of silts to 2 feet above the well screen. A bentonite plug of 5 feet (or as needed) will be placed above the sand and around the well riser, and allowed to hydrate and seal the borehole before clean fill is placed above the bentonite to the surface. Well installation and development will be in accordance with Maine guidelines (Microwell Installation Protocol, RWM-DR-009) and will be supervised by a Maine Certified Geologist. The screens will be set with the initial water level at or near the top of the screened interval.

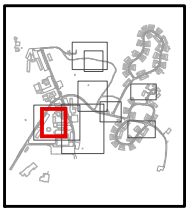
Upon development of the monitoring wells, a round of groundwater sampling will be completed. The groundwater sampling will be accomplished using low flow sampling methods in accordance with Maine guideline (Groundwater Sampling Using Low Flow Purging Sampling for Long-Term Monitoring, RWM-DR-002). Groundwater samples will be collected from within the middle of the screened interval. The low flow sampling will be completed using a peristaltic pump with flexible Teflon-lined tubing to extract the water from within the well.

Before the start of the groundwater sampling event, a round of water levels from the selected well field will be measured to contour the potentiometric groundwater surface. It is anticipated a total of 11 newly installed monitoring wells will be sampled and analyzed for VPH and EPH. Because the data are required as soon as possible to facilitate transfer of the property, samples will be placed on a turnaround time TAT of 7 days to expedite results. Based on recent discussions with Navy and MEDEP, wells proposed to be installed and sampled are as discussed below:

- Building 338: Three monitoring wells will be installed around Building 338 to determine the extent of any upgradient and downgradient dissolved phase DRO impacts (Figure 3-1).
- Building 378: Four monitoring wells will be installed to determine the extent of dissolved phase DRO impacts associated with the former location of an oil/water separator (Figure 3-2).
- Building 1099: Two monitoring wells will be installed to determine the extent of dissolved phase DRO impacts associated with inaccessible areas during the excavation (i.e., roadway and tree) (Figure 3-3).
- Building 1114: Two monitoring wells will be installed in and around the carports on the east side of Building 1114 to determine if any remaining dissolved phase DRO impacts remain from the former underground storage tank (Figure 3-3).



TOPSHAM ANNEX



LEGEND

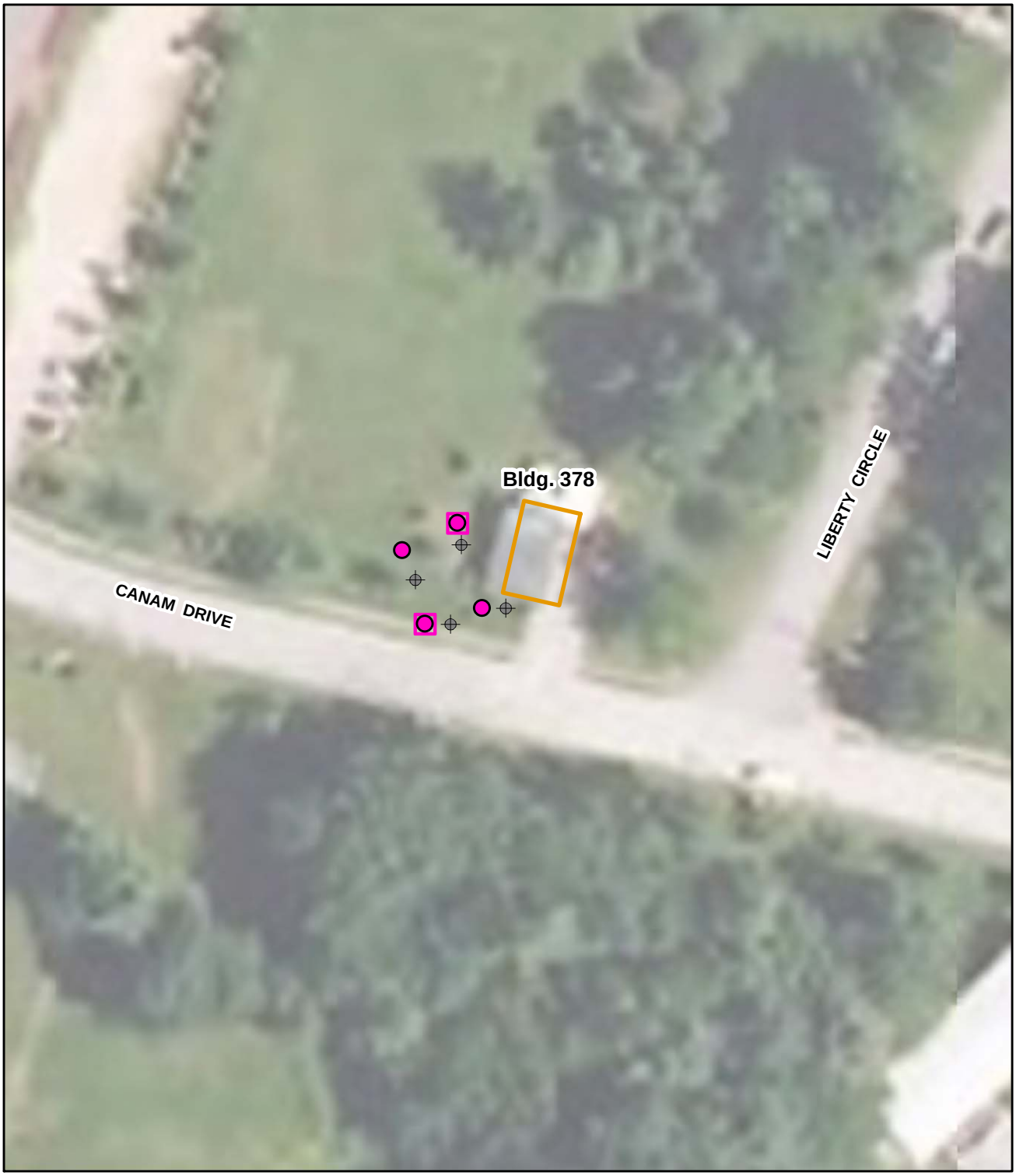
- Proposed Monitoring Well
- Proposed Monitoring Well and Soil Boring Location
- Excavation Confirmation Sample Location
- Historic Sample Location
- Building 338
- Former Excavation Area

N

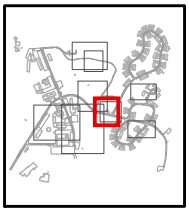
0 30 60
Feet

FIGURE 3-1
Building 338 Proposed Sample Locations

Topsham Annex
Naval Air Station Brunswick
Topsham, Maine



TOPSHAM ANNEX



LEGEND

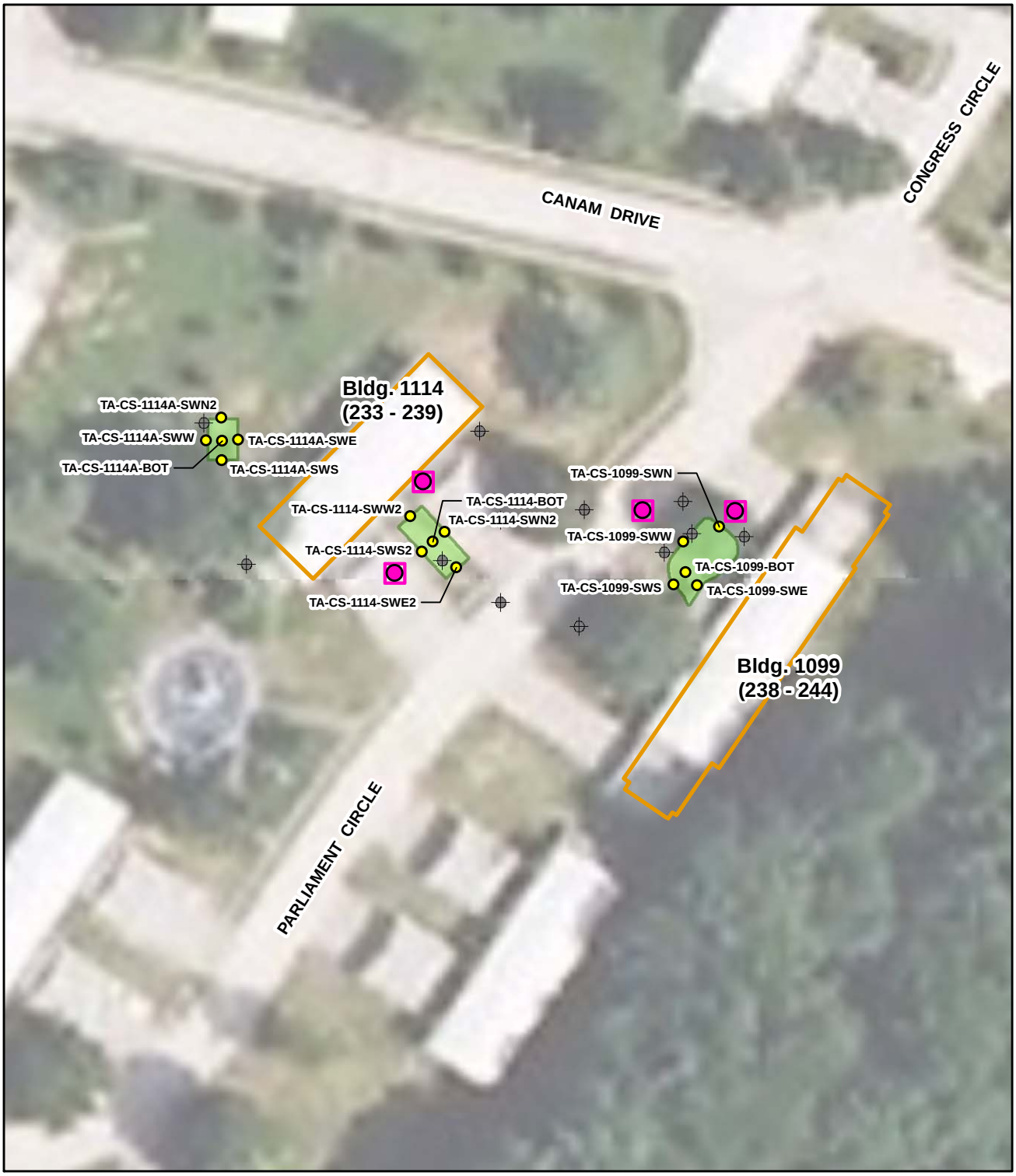
- Proposed Monitoring Well
- Proposed Monitoring Well and Soil Boring Location
- Historic Sample Location
- Building 378

N

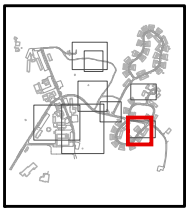
0 30 60

Feet

FIGURE 3-2
Building 378 Proposed Sample Locations
Topsham Annex
Naval Air Station Brunswick
Topsham, Maine



TOPSHAM ANNEX



LEGEND

- Proposed Monitoring Well
- Proposed Monitoring Well and Soil Boring Location
- Historic Sample Location
- Excavation Confirmation Sample Location
- Former Excavation Area
- Building 1114 and 1099

N

0 30 60
Feet

FIGURE 3-3
Building 1114 and 1099 Proposed Sample Locations

Topsham Annex
Naval Air Station Brunswick
Topsham, Maine

3.4 EM Survey and Test Pitting

A non-intrusive geophysical method will be utilized to characterize subsurface debris within the Skeet Range Debris Area (Figure 3-4) and Topsham Annex Debris Area (Figure 3-5). Actual EM survey areas will be determined based on the identification of anomalies during the field event. Surface geophysical techniques will include a EM metal detection survey using Geonics EM61-MK2 (or equivalent) and ground penetrating radar (GPR) profiling using a GSSI, SIR-3000 (or equivalent).

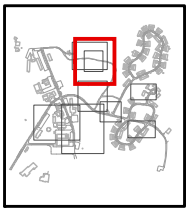
A visual inspection of each area will be made, locating any evidence of surficial debris. This information will be recorded in a scaled field Site Plan. Locations of visual evidence of surface and subsurface features or cultural materials (e.g., concrete, asphalt, metal containing debris) that may affect geophysical survey measurements will be identified and mapped.

EM-61 Metal Detector: A Geonics EM61-MK2 metal detector (or equivalent) will be used for the metal detection surveys. The EM61 is a portable time-domain instrument with a coincident transmitter/receiver coil and second parallel receiver coil for depth to target estimation and rejection of surface metal response. The instrument measures the secondary electromagnetic field response in millivolts (mV). The EM61 is designed specifically to locate medium to large buried metal objects such as drums and tanks while being relatively insensitive to above-surface metallic objects such as fences, buildings and power lines. The technique is sensitive to conductive metal up to a depth of approximately 12 feet. The size and burial depth of the metal determine the strength of the response. EM data is digitally recorded on a field computer. Readings can be triggered automatically (by time), manually or, if the wheel mode is used, readings can be recorded at regular intervals controlled by the rotation of the wheels. The wheel mode will be used for the surveys at this site and readings will be recorded every 0.63 foot along traverses spaced five feet apart.

Ground Penetrating Radar (GPR): GPR utilizes high frequency radio waves to probe the subsurface. Radar waves are transmitted into the ground from an antenna that is moved across the ground surface. In the subsurface, radar waves are reflected at interfaces of materials with contrasting dielectric properties. The returning signal is intercepted by a receiver and converted to a digital graphic image. The horizontal axis of the image is distance along the traverse. The vertical axis is two-way travel time of the radar pulses, in nanoseconds.

The GPR graphic images are examined and features noted on the images can then be transferred to a map. Tanks, pipelines and other objects with rounded tops (boulders, tree roots, or segments of old foundations, for example) may show up on the profiles as hyperbola-shaped reflections. Tanks and pipelines usually appear on more than one survey line as hyperbolic reflectors on lines perpendicular to the tank or pipe axis and as horizontal reflectors on lines along the axis. The GPR instrument to be used will be a GSSI, SIR-3000 (or equivalent). A 400-MHz antenna was used with a time range set for 80 nanoseconds. At this setting the depth surveyed is approximately 12 feet.

TOPSHAM ANNEX



LEGEND

Historic Sample Location

EM Survey Extent

Notes:

1. The exact location of EM Survey will be determined based on field reconnaissance.
2. Additional EM Survey may be performed if anomalies are identified outside the proposed area.

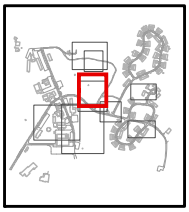
N

0 50 100

Feet

FIGURE 3-4
Skeet Range Debris Area
EM Survey Extent
Topsham Annex
Naval Air Station Brunswick
Topsham, Maine

TOPSHAM ANNEX



LEGEND

- Historic Sample Location
- EM Survey Extent
- Former Waste Disposal Area

Notes:

1. The exact location of EM Survey will be determined based on field reconnaissance.
2. Additional EM Survey may be performed if anomalies are identified outside the proposed area.

N

0 35 70
Feet

FIGURE 3-5
Topsham Annex Debris Area
EM Survey Extent
Topsham Annex
Naval Air Station Brunswick
Topsham, Maine

Field Survey Procedures: The field survey area will be marked with 10-foot by 10-foot orthogonal grid using tape measures and paint. EM61 readings will be recorded using the wheel mode at 0.63-foot intervals along north-south and east-west lines spaced 5 feet apart. GPR profiles will be produced on north-south lines spaced 5 feet apart. Following the survey, a sketch map will be made of the survey grid area.

Data Presentation: EM 61 data will be presented in plan view using Golden Software's Surfer program (or equivalent). The data can be color contoured or plotted as a color-coded class post map using various symbols. Sample GPR profiles will also be included with the report.

Test Pitting: If needed, locations for test pits will be determined based on the EM and GPR surveys and discussions with the Project Team. Test pits will be approximately 10 feet long by 2 feet wide and 8 feet deep or as determined by professional judgment based on field observations. During test pitting, samples will be collected for headspace measurements to determine any residual impacts to soil within the two debris areas; primarily for health and safety reasons. Headspace measurements will be completed using a 11.7 eV PID in accordance with MEDEP headspace procedures (Appendix A). In addition to headspace measurements, based on professional judgment (odors, staining, and/or discoloration) a petroleum soil-water shake test (Cheiron Resources, Ltd. product or equivalent) will be performed on a maximum of 10 locations per test pit area in accordance with MEDEP Draft SOP TS005 (Appendix B).

If the test pit area consists of construction debris (such as concrete and asphalt), then one composite sample will be collected from each test pit and submitted to a laboratory for analysis of PCBs, EPH, VPH, and Resource Conservation and Recovery Act (RCRA) 8 metals as indicated in Table 1-1 by AGVIQ-CH2MHILL. If debris other than concrete and asphalt (e.g., drums or miscellaneous metals) is observed, the Project Manager, NAVFAC MIDLANT, and MEDEP will be notified and a sampling plan will be determined.

It is anticipated that soil and any construction debris (i.e., concrete and asphalt) will be returned to the hole subsequent to the completion of test pit. If debris other than construction debris is observed, the debris will be placed in 55-gallon drums adjacent to the test pit for disposal at a later date as approved by NAVFAC MIDLANT.

Erosion and sediment controls in the form of silt fencing will be installed around the test pit areas as needed. The test pit areas will be restored to original condition by placement of topsoil and seeding/mulching. The test pit areas will be graded to provide positive stormwater drainage and prevent ponding or pooling once the site is restored with 3 inches of topsoil to match existing grades and slopes. The topsoil for this work will be uniform in quality and gradation, and will be free of roots, sod, weeds, and stones larger than 2 inches.

After topsoil placement has been completed, area will be raked or otherwise cleared of stones larger than 2 inches in diameter, sticks, stumps, and other debris that may interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. Native grass seed will be applied at a rate sufficient to establish growth and the area will be mulched and watered for a maximum of 2 days.

3.4 Waste Management

Waste such as soils from DPT sampling, decontamination fluids, and development and purge water from groundwater well installation and groundwater sampling will placed into two 55-gallon drums (one for solids and one water liquids) and appropriately labeled. As indicated in Table 1-1, one sample of the soil and water wastes will be collected and analyzed for disposal characterization. Based on the waste characterization data, the drums will be disposed of offsite at a licensed facility. Waste management practices will be in accordance with the Work Plan for soil removal at the NEX Service Station (AGVIQ-CH2M HILL, 2009).

3.5 Surveying

Soil sample locations and monitoring well locations will be recorded by a licensed land surveyor registered in the State of Maine.

Accurate survey and elevation data are required for development of an accurate groundwater model and graphical depictions of site geology or plume configuration.

Coordinates for new wells will be surveyed both vertically and horizontally by a licensed surveyor using the Maine West 1802, North American Datum 1983 coordinate system. Specifically, the elevation for each monitoring well will be established at the top of the monitoring well's inner PVC casing (this elevation point will be designated by a permanent notch placed on the top of each well's inner casing) and at ground surface.

3.6 Quality Control and Health and Safety

Groundwater and soil sampling and analysis will comply with the QA/QC protocol specified in Section 4.0 of the Sampling and Analysis Plan, Navy Exchange (NEX) Service Station Site (AGVIQ-CH2M HILL, 2008). Samples will be sent to Katahdin Laboratory for analysis.

Generated wastes will be managed in accordance with Section 3.5 of the Sampling and Analysis Plan, Navy Exchange (NEX) Service Station Site (AGVIQ-CH2M HILL, 2008).

All health and safety procedures will be in accordance with the Health and Safety Plan (AGVIQ-CH2M HILL, 2009).

3.7 Traffic Control Plan

Traffic control at the project site will be the responsibility of the AGVIQ-CH2M HILL Field Team Leader. AGVIQ-CH2M HILL will minimize disturbance to any site operations during field activities. AGVIQ-CH2M HILL will consult with CSO personnel to evaluate site access, placement of equipment, and traffic flow to minimize the impact of this work to the residents and school.

3.8 Schedule

The field work is expected to be completed during the week of August 08, 2011. The work hours for field activities are 7:00 AM to 5:00 PM, Monday through Friday, except federal and state holidays. Equipment, supplies, and materials will be received or shipped during the defined work hours.

Extended work hours or different work hours will be coordinated with the CSO prior to start of work. Depending on the magnitude of adverse weather and its potential impact to the project schedule, time lost during the scheduled workweek may be made up on an accelerated schedule (including evenings and weekends) as directed by the CSO.

4.0 Technical Memorandum and Recommendations

Subsequent to receipt of the analytical and survey results, a technical memorandum documenting the field event and sampling results will be provided to the Project Team. The technical memorandum will include, but is not limited, to the following:

- Summary of field activities including any unexpected finding or observations
- Deviations from this SAP Addendum No. 2
- Representative photographs of field investigation actions
- Complete set of all field tests and laboratory analytical results regardless of constituents of concern
- Updated site drawings

Based on the results, AGVIQ-CH2M HILL will make recommendations for no further investigation or additional sampling.

5.0 References

AGVIQ-CH2M HILL. 2008. *Sampling and Analysis Plan, Navy Exchange (NEX) Service Station Site.* Prepared for the Department of the Navy, Naval Facilities Engineering Command, Mid Atlantic. October.

AGVIQ-CH2M HILL. 2009. *Health and Safety Plan, Naval Exchange Service Station UST and Soil Removal*. Prepared for the Department of the Navy, Naval Facilities Engineering Command, Mid Atlantic. September.

EA Science and Technology (EA). 2006. *2004 Investigation Report*. Prepared for the Department of the Navy, Naval Facilities Engineering Command, Mid Atlantic. February.

Maine Department of Environmental Protection (MEDEP), Bureau of Remediation and Waste Management. 2009. *Remediation Guidelines for Petroleum Contamination Sites in Maine*. November.

Massachusettes Department of Environmental Protection (MA DEP), Division of Environmental Analysis. 2004. *Method for determination of Volatile Petroleum Hydrocarbons.* May.

Tetra Tech EC, Inc. 2006. *Final Work Plan (R1) For TPH Soil Remediation And Investigation Activities Topsham Annex, Naval Air Station Brunswick, Topsham, Maine.* Prepared for Engineering Field Activity, Northeast, Naval Facilities Engineering Command. July.

Tetra Tech EC, Inc. 2007. *Draft Closeout Report for TPH Soil Remediation and Investigation*. Prepared for the Department of the Navy, Naval Facilities Engineering Command, Mid Atlantic. January.

Tetra Tech NUS, Inc. 2011. *Site Inspection Report for Munitions Response Program Site, Topsham Annex Skeet Range,* Naval Air Station Brunswick, Brunswick, Maine. April.

U.S. Environmental Protection Agency (EPA) Region 1. 2010. *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples From Monitoring Wells*. Region 1, SOP#GW0001. Revision 3. January.

Appendix A
MEDEP SOP - Compendium of Field Testing of Soil Samples for Gasoline and Fuel Oil

COVERSHEET
STANDARD OPERATING PROCEDURE

Operation Title: **COMPENDIUM OF FIELD TESTING of SOIL SAMPLES for GASOLINE and FUEL OIL**

Originators: **Fred Lavallee, Rob Peale, Troy Smith and Deb Stahler**
Division of Technical Services
Bureau of Remediation and Waste Management
Department of Environmental Protection

Standard Operating Procedure: TS004
REVISION: 1
DATE: April 20, 2011

George Seel — Signature — 4/20/11

George Seel
Oil Program Manager

Signature

Date

Definition of Acronyms

Acronym	Definition
AOC	Area of Concern
AST	Above ground Storage Tank
BRWM	Bureau of Remediation and Waste Management
CSM	Conceptual Site Model
CSS	Confirmation Screening Sample
DQO	Data Quality Objective
DR	Division of Remediation
EDD	Electronic Data Deliverable
EGAD	Environmental and Geographic Analysis Database
EPS	Expanded Polystyrene
ESA	Environmental Site Assessment
ESS	Excavation Screening Sample
FGS	Feet below Ground Surface
GW	Groundwater
LS	Laboratory Sample
LUST	Leaking Underground Storage Tank
°F	Degrees Fahrenheit
PID	Photo Ionization Detector
PPM	Parts Per Million
PPMV	Parts Per Million by Volume
QAP	Quality Assurance Plan
RAG	Remedial Action Guideline
REC	Recognized Environmental Condition
RS	Response Services
SAP	Sampling Analysis Plan
SOP	Standard Operating Procedure
TS	Technical Services
UST	Underground Storage Tank

1.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management (BRWM) procedure for petroleum field testing of soils.

2.0 APPLICABILITY

BRWM is responsible for the investigation and remediation of petroleum sites throughout Maine. The procedures described herein are field tests for (1) determining relative levels of gasoline present in soil with a PID instrument and (2) screening soils contaminated with kerosene and fuel oil using an oleophilic dye test.

The PID Bag Headspace Test is applicable only for soils contaminated with gasoline. It is not applicable for heavier petroleum products such as kerosene or fuel oil.

The Oleophilic Dye Test is applicable for fuel oils. It is not applicable for use with heavy crude oils (Bunker C) or bituminous materials like asphalt or waxes. Mineral oil and motor oils may be detected; however, the detergents in some synthetic motor oils may interfere with color development.

Both tests are needed to screen soils for gasoline and fuel oils at sites contaminated with mixed or unknown petroleum products.

When these procedures are strictly followed results may be used to make key field decisions and provide information for site assessments.

3.0 RESPONSIBILITES

All staff must be appropriately trained prior to performing these tests for the investigation of petroleum sites and that training must be documented in accordance with the LUST QAP (http://www.maine.gov/dep/rwm/ust/lustqaplan.htm). Generally, it is the field personnel of BRWM/Technical Services (BRWM/TS), BRWM/Response Services (BRWM/RS) and BRWM/Remediation (BRWM/DR) who will be responsible for performing these tests.

The directors of the Divisions of Response Services, Technical Services and Remediation as well as all supervisors in those divisions are responsible for ensuring that staff understand and adhere to these procedures when used for key field decisions or site assessments.

4.0 INTRODUCTION

This SOP includes two field tests for petroleum along with guidance for their application for site work.

For the PID bag headspace test, a soil sample is placed in an approved container and the volatile constituents are allowed to come to equilibrium. The headspace is then measured with an isobutylene calibrated PID, with a result expressed in parts per million by volume (ppmv).

For the oleophilic dye test, soil is added to the sample bottle, to which oil-free water is also added and the contents shaken vigorously with a rapidly dissolving red or blue oleophilic dye.

The oleophilic dye stains petroleum products red (or blue). When petroleum is released from the soil it attaches to an expandable polystyrene (EPS) bead and/or attaches to the walls of the container. Where no visible oil layer is present the bead will turn pink or blue down to the limit of detection which is about 500 ppm.

5.0 PLANNING

As with any sampling event, a sampling and analysis plan (SAP) and a health and safety plan (HASP) should be developed. Guidance for the development of a Sampling and Analysis Plan can be found in DR SOP #014 – Development of a Sampling and Analysis Plan (http://www.maine.gov/dep/rwm/sops/index.htm).

Processing one sample will take approximately 15-30 minutes from initial sample collection through recording results. It is important to plan for someone to complete the sampling and analysis in a careful and timely fashion for results to be useful.

6.0 EQUIPMENT

6.1 The following equipment is required for conducting the PID bag headspace procedure for gasoline:

- Soil sampling equipment such as shovel, bucket auger, soil borer, scoops; 200g container (6 ounce can), 20g and 5g soil coring devices.
- Approved containers: Bags are made from a double layer of strong metalized polyester and low-density polyethylene (3 mil) with dimensions: 8-1/2" x 12" stand-up zipper pouch with 3-1/2" bottom gusset. Note: Associated Bag Company Item Number 183-52 meets these requirements. Other products may be acceptable. Standard re-sealable plastic bags such as sandwich or freezer bags are **not** acceptable because they do not adequately prevent the loss of gasoline vapors.
- An approved PID with a lamp energy of 10.2 to 10.6 eV; and
- Calibration equipment, including users' manual, for particular PID to be used.

6.2. The following equipment is required for conducting the oleophilic dye procedure for fuel oils:

- Soil sampling equipment such as shovel, bucket auger, soil borer, scoops
- 50 ml plastic sample bottles containing appropriate dyes and EPS bead. Kits from two commercial test kit companies, Oil-In-Soil and OilScreenSoil have been successfully tested by MEDEP for use according to this SOP. Red dyes are preferred, but Indigo Blue kits are available for use when soil color interferes with interpretation of red dye test kits.
- Oil-free water

7.0 PROCEDURE for PID BAG HEADSPACE

7.1. Use of a PID can be found in Division of Remediation SOP DR#019 – Protocol for Use of a PID/FID (http://www.maine.gov/dep/rwm/sops/index.htm). It is recommended that the operator that will be conducting this procedure take the time before the sampling event to familiarize themselves with the particular instrument that will be used, if they are not already familiar with that instrument. This includes reviewing the specific user manual, and calibration and practice with the instrument prior to the sampling event.

7.2. The PID must be calibrated to isobutylene according to manufacturer instructions. Check the calibration ("bump test") against the 100 PPM isobutylene standard and record the results. Bump test results must be 100±10 PPM. The PID must be bump tested at least every 2 hours and at the end of the day. If the bump test falls outside 100±10 PPM it

should be re-calibrated. Record all bump test results. **Note: no adjustment is made for set points; the response factor should be 1.0 for all instruments.**

7.3. Evaluate PID high concentration performance before arriving at the site each day of use. This can be accomplished by measuring the headspace over pure acetone or other suitable substance that normally produces values higher than the Outdoor Commercial Worker/ Excavation-Construction Worker screening number from Table 1. The PID must not be used for site work if performance does not meet the expectation.

7.4. Collect the soil sample with appropriate soil sampling equipment, as outlined in the site specific Sampling and Analysis Plan (SAP)(See SOP DR#014 - Development of a Sampling and Analysis Plan) or the applicable appendix to this SOP.

- Do test in triplicate (at a minimum), taking co-located samples. True replicates are difficult to collect. It is important to collect at least three samples when using the results to make key field decisions.
- Label and open the bags. Unfold the bottom gusset in each bag to facilitate a uniform headspace volume when the bags are closed. This is particularly important for smaller sample sizes.
- Place appropriate mass of soil in aluminized bag.
    - For Leaching to Groundwater cleanup scenarios use 200 g soil (6 oz can)
    - For Resident or Park User cleanup without regard to groundwater use 20 g soil (20 ml syringe or plug sampler)
    - For Outdoor Commercial Worker/ Excavation-Construction Worker cleanup scenarios use 5 g soil (5 ml syringe or plug sampler)
- Close bag leaving uniform headspace.
- Knead samples (in closed bag) if needed to break up clumps, then shake bags for 30 seconds.
- Warm sample if needed and let stand at 70°F for 10 minutes.
- Knead/shake bags for additional 30 seconds.
- Let stand for 2 minutes. Do not let samples stand for more than a total of 30 minutes before PID measurement. Gasoline vapors can migrate through bags. Testing indicates up to 20% loss after sitting for 60 minutes at 70°F in the metalized bags.
- Open bag carefully and insert probe of calibrated PID one third to half way down bag (approximately 4 inches). Keep bag seal closed as much as possible around probe.
- Allow instrument to read until concentrations start to fall.
- Record highest sustained reading.
- Repeat for additional bags.

7.5. Result Interpretation

- Table 1 presents field cleanup guidelines for the various exposure scenarios. Values in Table 1 are dependent on sample size and PID model. Only approved PID models may be used. Remediation is indicated if the average sample result is at or above the Table 1 value for the site's cleanup scenario.
- Excavation Screening Samples and other samples where only one bag per sample is tested: compare results to Table 1 values.
- Confirmation Screening Samples and other samples where more than one bag per sample is tested: Average the three (or more) sample results and compare to Table 1 values.

- Alternatively, a PID can be calibrated to a gasoline contaminated site if sufficient laboratory MA VPH sample data are available for comparison. Any alternative calibration must follow a Department approved plan.

8.0 PROCEDURE FOR FUEL OIL OLEOPHILIC DYE TEST

8.1 Collect the soil sample with appropriate soil sampling equipment, as outlined in the site specific Sampling and Analysis Plan (SAP)(See SOP DR#014 - Development of a Sampling and Analysis Plan) or the applicable appendix to this SOP.

8.2 Perform test as follows:

- Add soil to sample bottle (50 ml plastic sample bottles containing appropriate dyes and EPS bead) according to manufacturer's instructions.
- Label bottle.
- Add oil free water to sample bottle according to manufacturer's instructions.
- Shake vigorously until dye cube dissolves (about 30 seconds)
- Allow sample to sit for 10 minutes for color development on bead.
- Use indigo blue dye when results are inconclusive with red dye.

8.3 Results are reported as saturated, positive, slightly positive and undetected as described below:

- **saturated** when obvious red (or blue) dye is observed in the soil matrix, or in/on the water (may stain the side of the jar);
- **positive** when only the EPS bead is dyed dark pink/ red or blue and there is no coloration in the soil or water;
- **slightly positive** when only the EPS bead is dyed light pink or blue and there is no coloration in the soil or water; or
- **undetected** when there is no coloration in the soil or water and the EPS bead remains white.

8.4 Results are interpreted as described below:

- **Undetected** result indicates no cleanup is required unless laboratory results indicate an exceedance of a leaching to groundwater exposure criteria.
- **Positive/ slightly positive** result indicates cleanup is needed for leaching to groundwater and resident/ park user scenarios as described in the Remediation Guidelines for Petroleum Contaminated Sites in Maine.
- **Saturated** results indicate cleanup is needed for leaching to groundwater, resident/ park user and outdoor commercial/ excavation-construction worker scenarios as described in the Remediation Guidelines for Petroleum Contaminated Sites in Maine.

Note: Testing performed to date indicates that an undetected result will be protective of leaching to groundwater in most cases. Laboratory analyses may be needed to ensure all guidelines are met. The Department will continue to collect and review results to evaluate whether or not this test may be used to determine when cleanup is needed for leaching to groundwater scenarios.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

All field tests must be completed and documented according to these written procedures.

Samples will be collected in accordance with a site specific sampling plan or as outlined in the applicable appendix to this SOP.

PID calibration must be checked at the beginning and end of each day and every two hours while testing is performed. Results must be 100±10 PPM for initial calibration check. If subsequent checks fall outside 100±10 PPM the PID should be recalibrated. All recalibration and calibration checks (bump tests) must be documented on the field sheet or in the field notebook.

PID high concentration performance must be evaluated and documented before each day of use.

All PID Bag Headspace samples used for key field decisions or assessments performed for compliance to Chapter 691 rules must be taken in triplicate (at a minimum).

Quality control samples will be taken in accordance with the LUST QAP.

Additional quality assurance/ quality control tasks may be needed based on the DQO requirements of the project.

10.0 DOCUMENTATION

Field notes should be collected following the standard procedures as outlined in 6.0 of the LUST QAP. When documenting such a sampling event, one should include enough information so that a person at a later date can easily duplicate the sampling and be able to compare the results. Any deviations from these procedures must be documented.

Record results for the PID bag headspace test on the form provided in Attachment 1. Results may alternatively be recorded in the field notebook as long as all information from Attachment 1 is recorded. Additionally, some PIDs have software which can record data. Any special method of recording and documenting results must be outlined in the SAP.

Record results for the oleophilic dye test on the form provided in Attachment 2. Results may alternatively be recorded in the field notebook as long as all information from Attachment 2 is recorded.

Results for CSS with corresponding laboratory analysis should be submitted to the Department in the Maine DEP electronic data deliverable [EDD] format. Excel spreadsheets (http://www.maine.gov/dep/rwm/ust/sop/EDD_Oil_Field_Sheets_blank.xls) for use specifically with these field tests as well as laboratory EDD spreadsheets (http://www.maine.gov/dep/rwm/egad/ME_DEP_EGAD_EDDv5.1_FINAL_rhd.xls) are available from Maine DEP. The Excel spreadsheets for these field tests follow the format of Attachment 1 and Attachment 2. Note: Submission of EDD should not include ESS field screening results. Only CSS with the corresponding laboratory results should be submitted for uploading to the Environmental and Geographic Analysis Database [EGAD].

Table 1: Approved PID Field Cleanup and Notification Guidelines

Cleanup Scenario	Soil size [grams]	Ion	Thermo	Passport	Foxboro	MiniRAE	Photon
Leaching to GW/ Notification	200	80	60	60	50	40	40
Resident/ Park User	20	700	275	500	250	350	300
Outdoor Commercial Worker/ Excavation-Construction Worker	5	1200	500	850	375	1500	400

Note: no adjustment is made for set points; the response factor should be 1.0 for all instruments.

Instrument Descriptions

Ion: Ion Science PhoCheck Series

Thermo: Thermo Environmental OVM 580 Series

Passport: MSA Passport PID II OVM

Foxboro PID: Foxboro TVA-1000 PID mode

MiniRAE: RAE Systems MiniRAE 2000 and MiniRAE 3000

Photon: MSA Photon Gas Detector

TS004 Bag Headspace Field EDD Sheet												
Site Name:									Spill #			
Town:									Sampler:			
Air Temperature:		Date:							Sample Method			
Calibration Gas Concentration:									Soil Heating Method:			
Confirm high end measurement:									PID Instrument:			
Calibration Documentation					**Bumptest Documentation**				Weather:			
Time 1:		Reading 1:			Time 1:		Reading 1					
Time 2:		Reading 2:			Time 2:		Reading 2					
Time 3:		Reading 3:			Time 3:		Reading 3					

Calibration readings 1Site Name/ Spill #:2 and 3 readings are post-calibration checks. PID/Headspace Operators:

Sample ID	Depth [FGS]	Sample Size	Collection Time	Analysis Time	Bag-1	Bag-2	Bag-3	Average	Soil Type	CSS Location	Comments

TS004 Oil Shake Test Field EDD Sheet					
Site Name:				Town:	
Date:			Sample Method:		
Spill #				Sampler:	
Ambient Temperature:				Weather:	
Sample ID	Depth [FGS]	Result	Soil Type	CSS Location	Comments

SA = Saturated- obvious red (or blue) dye is observed in the soil matrix, or in/on the water (may stain the side of the jar)
PO = Positive- the EPS bead is dyed dark pink/ red or blue and there is no coloration in the soil or water
SP = Slightly Positive- the EPS bead is dyed light pink or blue and there is no coloration in the soil or water
U = Undetected - No observations of dye coloration on EPS bead, soil, or water

Field Sampling Procedure for Excavations

Appendix A is to be used at soil removals and excavations where the data quality objective is to meet the Soil Exposure Guidelines in Section 5 of the Remediation Guidelines for Petroleum Contaminated Sites in Maine. Appendix A is not intended for remediating releases under Section 3 of the Remediation Guidelines for Petroleum Contaminated Sites in Maine. The basis of this procedure is that field samples will be used to direct soil excavation and confirm that field screening objectives are met prior to terminating the excavation and collecting laboratory samples. The following procedure should be followed when the objective is to determine excavation limits based on field screening. The following procedure is not intended to override the Conceptual Site Model (CSM) or other site specific objectives for the removal action. If termination of the excavation is not based on field screening procedures, then the reasons should be clearly presented in post removal documentation. A site specific sampling plan that differs from this procedure may be applied if approved in advance by the Department.

This procedure uses three types of samples as defined below. The sample type definitions are provided to help clarify what is meant by terms used in this document.

Excavation Screening Samples (ESS). Use ESS to define soils to be removed. These are field screened samples generally collected to help direct the soil excavation (see Appendices B and C for other uses). These samples may represent soils that are removed during an excavation because they exceed the field screening guidelines, or they may represent soils that remain in place. Triplicate sampling is not required for PID Bag Headspace test of ESS for this application. Documentation of the ESS is at the discretion of the Environmental Professional completing the sampling.

Confirmation Screening Samples (CSS). CSS should identify areas of the excavation where cleanup objectives have been reached or where site limitations prevent further excavation. These field screened samples represent soils that remain in place. Triplicate samples are required for Bag Headspace test of CSS. CSS must be documented and include all information presented in Attachment B.

Laboratory Samples (LS). These are lab samples that are collected at the termination of the excavation and represent soils that remain in place. They are collected at a rate of 1 - LS per 10- CSS. Please remember, you can collect as many excavation screening samples as you need to help direct the excavation without collecting any LS. However, once you have reached the limits of the excavation and CSS are collected, then a minimum of one LS will be collected for each ten CSS collected. The LS should be co-located with the corresponding CSS location or locations.

CONCEPTUAL SITE MODEL [CSM]

The Appendix A procedure is intended to fit within the context of the CSM when the objective for the site is to complete an excavation based on field screening methods described in this SOP. In cases where the CSM justifies variation from the procedure outlined in Appendix A, the CSM must be presented in written form and included in the post removal document that is available for future investigators. The CSM must include a concise explanation of the sources present at the site and on adjoining properties (surface spill, AST, UST, product piping, loading rack, and fuel dispensers); receptors (on-site and off-site); and the risk scenario (Leaching to Groundwater, Resident/Park User, Outdoor Commercial Worker/Excavation-Construction Worker). Keep in mind that the risk scenario may change if contamination extends onto an adjoining property.

SAMPLING STRATEGIES

During the soil removal various sampling strategies can be utilized to expedite decision making. For example, a large sample (full bag) can be collected from the excavation and brought to a work table for processing. For gasoline contaminated sites, an initial PID screening of the soil (quick bag headspace with a 1-minute headspace equilibration) can be done to determine the relative concentration of gasoline contamination that is present. If the initial screening shows that results are above the termination criteria then no further processing may be necessary and the soil in the bag can placed in a truck for disposal. If the initial screening determines that the concentrations may be near the termination criteria, then triplicate samples can be prepared. This sampling strategy requires quick processing and handling. Triplicate samples should be prepared within a few minutes of collecting the large sample volume from the excavation.

SAMPLE FREQUENCY

Excavation Screening Sampling (ESS)

The sampling frequency and documentation of ESS is up to the discretion of the environmental professional responsible for directing the excavation. Once the environmental professional determines that sufficient soils have been removed, CSS should be collected to document the decision to terminate excavation.

Confirmation Screening Samples (CSS)

The collection of CSS is separated into specified depth intervals to account for direct contact risks and risks associated with contaminant migration (oil saturated soils, free-product, or leachable to groundwater). The specified depth intervals are based on the definitions of *Accessible, Potentially Accessible,* and *Isolated Soil* included in The Maine Remedial Action Guidelines (RAGs) for Soil Contaminated with Hazardous Substances.. The top two feet is defined as *accessible soil* and represents that greatest potential direct contact and ingestion risk. Therefore, samples are required for determining the risks in the upper two feet. Below two feet the soils are considered *potentially accessible* to a depth of 15-feet unless the soils are covered by a building or other permanent structure that does not have earthen floors. Below 15-feet the soils are considered *isolated* for contact risk, but may represent a groundwater leaching pathway.

Lab Samples (LS)

LS frequency is set at 10% of total CSS analyzed for the excavation. LS should be co-located with a CSS and documentation of the co-located samples should be clear for future investigators.

MINIMUM SAMPLE LOCATIONS

Top Two Feet of Excavation

A minimum of one CSS is required in the top two-feet for each ten-foot section of excavation exposure. The excavation exposure is the total perimeter distance of the excavation.

Below Two Feet of Excavation

A minimum of one CSS is required for each 100-square feet of wall exposure (10 x 10) below the two-foot depth.

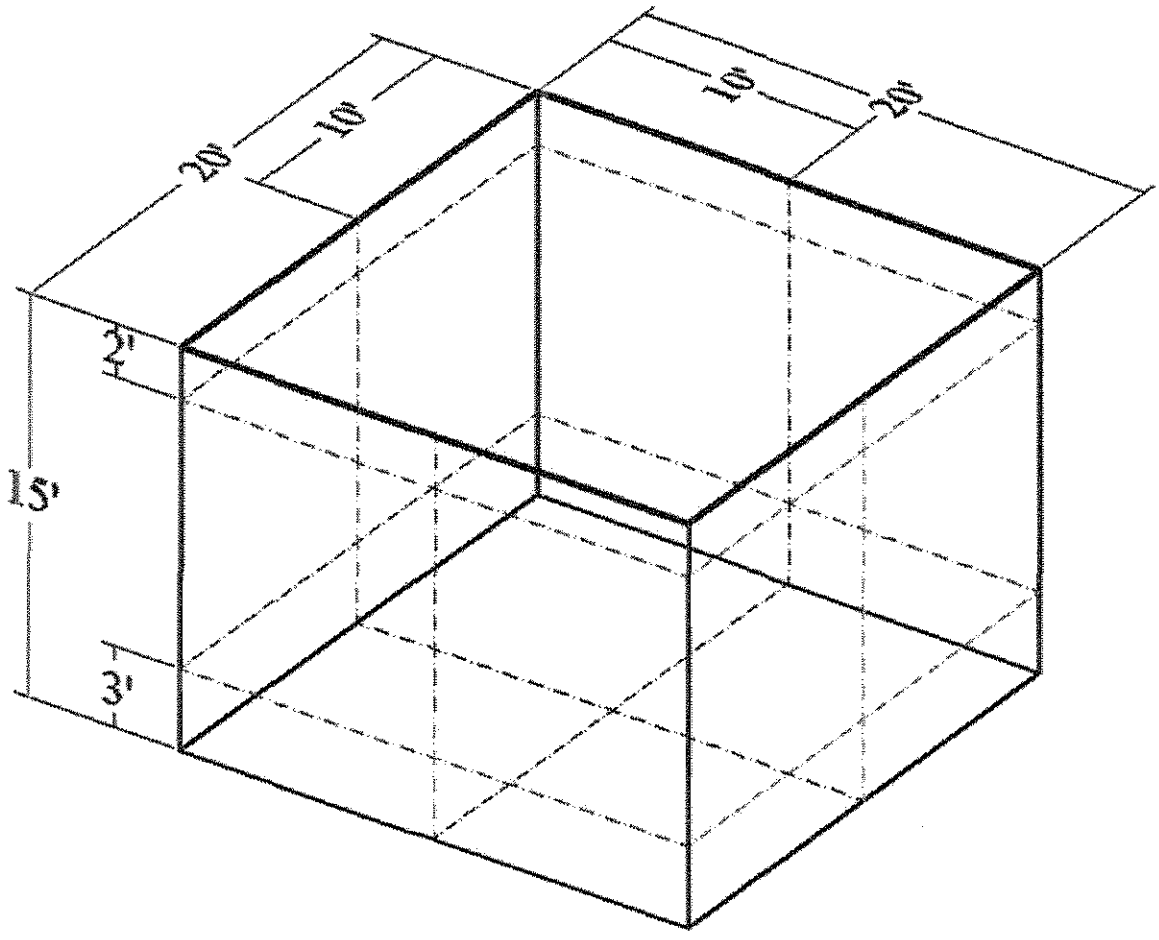
Floor Sampling

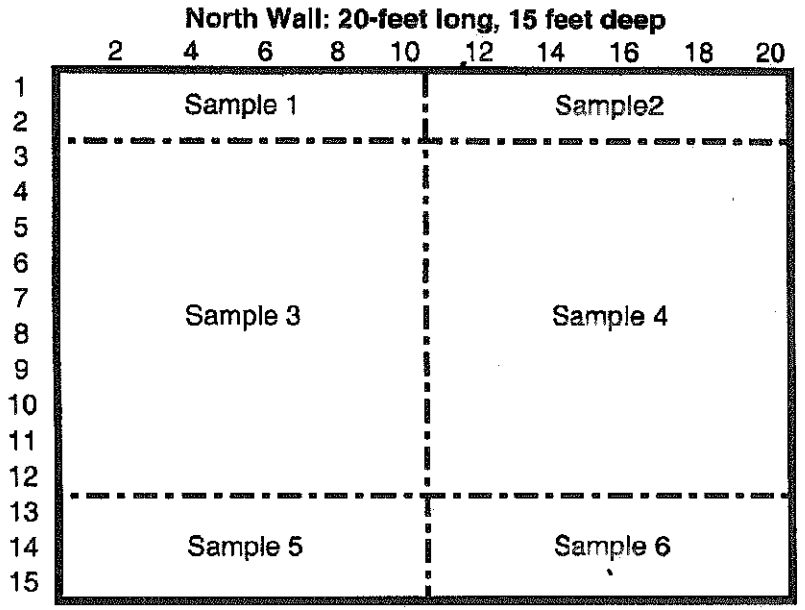
On the floor, a minimum of one CSS sample shall be collected for each 100-square feet of floor exposure (10 x 10). Keep in mind that due to side wall sloping, the floor exposure is likely to be smaller than the foot print of the excavation.

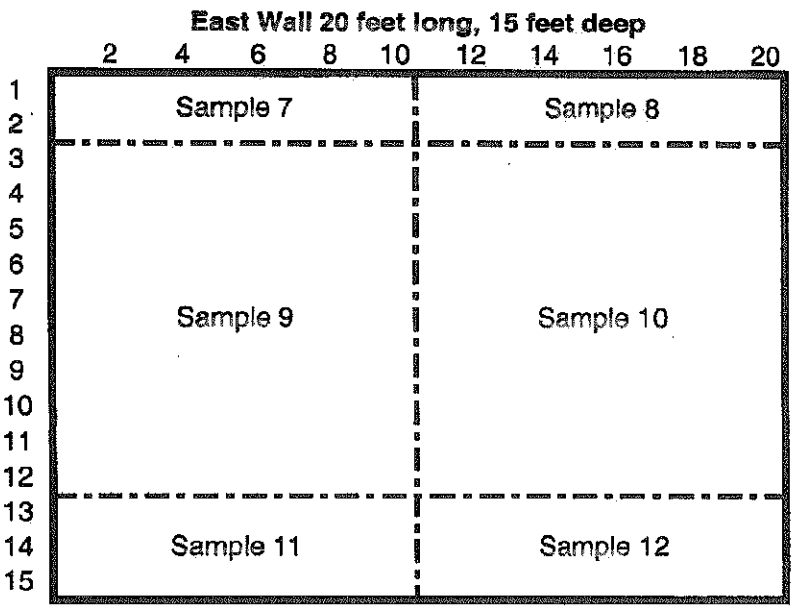
EXAMPLE

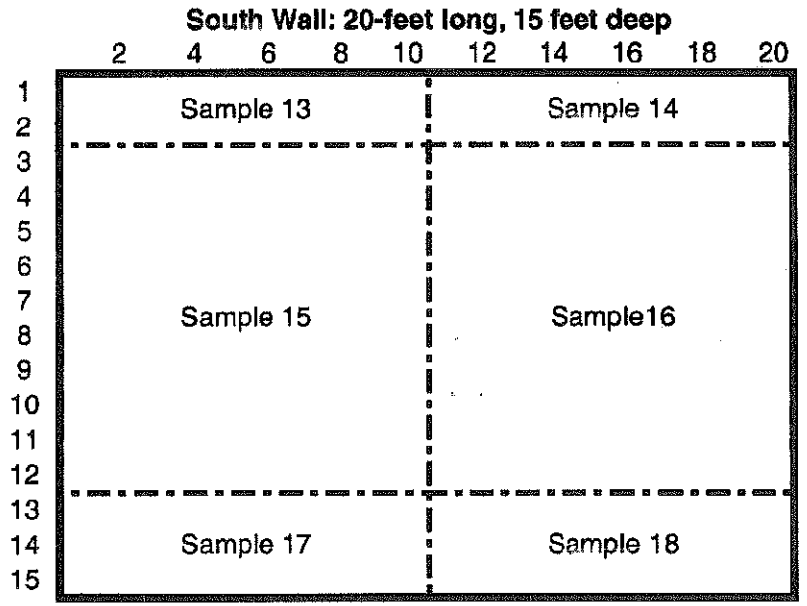
An excavation oriented north-south that is 20-feet long, 20-feet wide, and 15-feet deep represents a removal of approximately 222 cubic yards (Figure 1). The perimeter measures 80-feet and the walls are vertical to keep things simple. This excavation would require a minimum of 28 CSS locations as shown below. The 28 samples included: eight CSSs from 0-2 feet, eight samples from 2-12 feet, eight samples from 12-15 Feet, and four samples from the floor. This example would require a minimum of 3 LS.

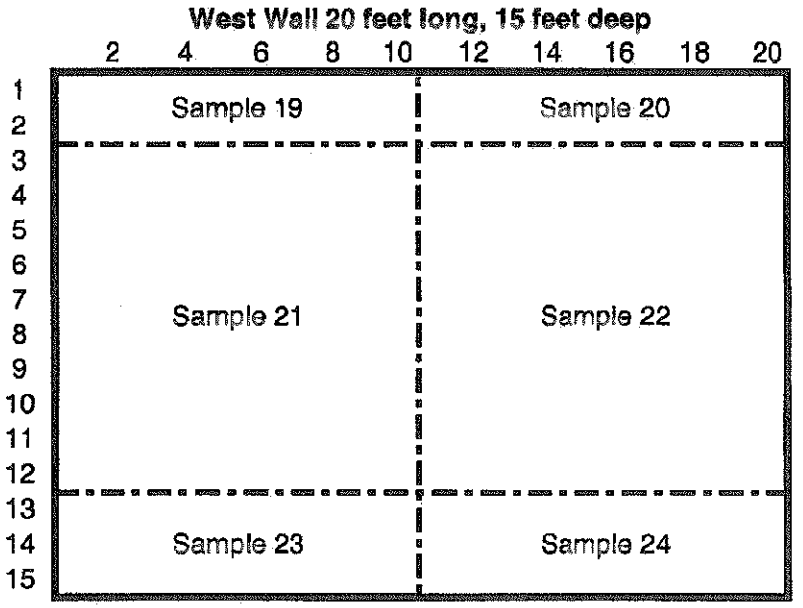
Excavation Example 3D View

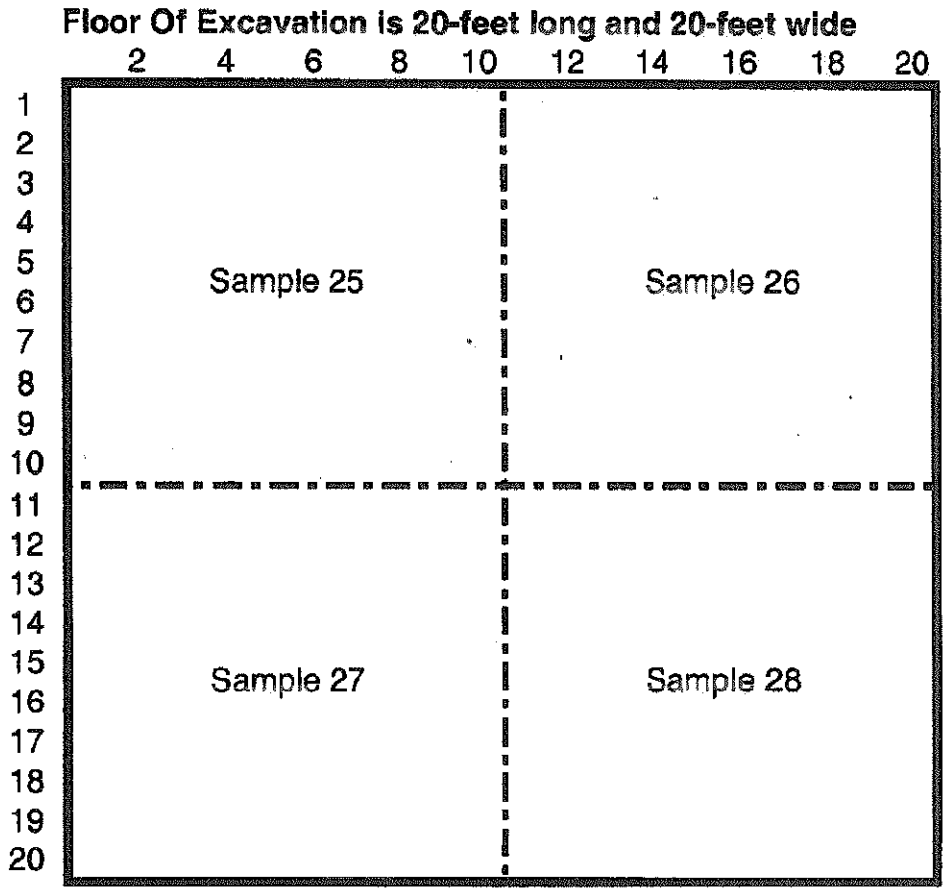



North Wall: 20-feet long, 15 feet deep
2 4 6 8 10 12 14 16 18 20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Sample 1
Sample2
Sample 3
Sample 4
Sample 5
Sample 6


East Wall 20 feet long, 15 feet deep
2 4 6 8 10 12 14 16 18 20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Sample 7
Sample 8
Sample 9
Sample 10
Sample 11
Sample 12


South Wall: 20-feet long, 15 feet deep
2 4 6 8 10 12 14 16 18 20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Sample 13
Sample 14
Sample 15
Sample16
Sample 17
Sample 18


West Wall 20 feet long, 15 feet deep
2 4 6 8 10 12 14 16 18 20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Sample 19
Sample 20
Sample 21
Sample 22
Sample 23
Sample 24


Floor Of Excavation is 20-feet long and 20-feet wide
2 4 6 8 10 12 14 16 18 20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Sample 25
Sample 26
Sample 27
Sample 28

Field Sampling Procedures for Environmental Site Assessment [ESA] Investigations

1. Introduction

The purpose of this appendix is to provide for application of the field procedures to ESAs, which include Phase II assessments, property transactions, or similar environmental investigations. This procedure focuses on analyzing surface and subsurface soil samples. Sample collection methods may include backhoe/excavator, split spoon, direct push, bucket auger, or hand tools.

Results of the field methods can be used for selecting samples for laboratory analyses, determining if DEP notification levels have been exceeded, and for making risk-based decisions for the site.

In situations where the field methods will be used to make risk-based decisions a site specific sampling plan must be developed prior to completing the field investigation to assure that the appropriate risk-based criteria and field methods are applied to the site.

This procedure specifies methodologies for field screening to make risk-based decisions and DEP notification determinations. This procedure also specifies methodologies for using field screening to select laboratory samples where decisions are based on the laboratory results and not the field results.

This procedure establishes certain documentation requirements for recording the soil sampling method used to obtain samples.

The method or methods selected for field screening will depend on the scope of the investigation and the contaminants of concern. In general the oleophilic dye test is for determining the presence of petroleum saturated soil (gasoline, diesel, fuel oils, or kerosene) or for determining the relative concentration of diesel, fuel oil, or kerosene contamination present. The PID bag headspace test is appropriate to determine the relative concentration of gasoline contamination, and may be useful in detecting the presence of fuel oil or kerosene contamination but it cannot be used to determine the absence of fuel oil or kerosene.

2. Sampling Purpose

DEP staff and other environmental professionals using the field methods must understand the purpose for collecting the samples prior to completing the Environmental Site Assessment (ESA). The purpose for sample collection will determine how to apply the procedures at a specific site. It is strongly recommended that historical research be performed and a sampling plan be developed for all ESAs by a qualified environmental professional.

2.1 Field Screening for Laboratory Analyses

The field procedures may be used to select samples for appropriate laboratory analyses (VOC, SVOC, VPH, EPH, lead, etc.). Under this approach, the procedures will be used to determine the relative presence of VOCs detectable with the selected PID and/or the relative presence of middle distillate SVOCs detectable with the oleophilic dye test. However, risk-based decisions will not be based on the field screening methods. Instead risk-based decisions will be based on the laboratory results. PID bag headspace samples collected for this purpose are not required to be completed in triplicate.

Note: the sample volume used for screening should be based on the linear range of the PID selected. Based on the Department's experience the approximate limit of linearity is 10% higher than the Table 1 Outdoor Commercial Worker/ Excavation-Construction Worker Scenario field cleanup guidelines regardless of sample size.

2.2 Field Screening for DEP Notification

The field procedures may be used to determine if the DEP notification level at petroleum sites has been exceeded. Appendix C discusses the application of the field procedures to the UST Site Assessment process. Section 2.2 applies where the screening is not related to an UST site assessment but the ESA is being completed to determine if DEP notification is warranted. For this purpose, PID bag headspace samples will be collected in metalized bags in triplicate with all three samples targeting the same depth (see sample methodology Section 3 for additional discussion). Sample size will be 200 grams as specified on Table 1, page 8 of the SOP.

2.3 Field Screening for Risk-Based Decisions

The field screening procedures may be used as a basis for making risk-based decisions at petroleum sites. DEP staff and other environmental professionals should determine the appropriate exposure scenario (leaching, resident, park user, commercial, excavation) for the project based on the CSM, the appropriate sample depth criteria (accessible, potentially accessible, and isolated), and the applicability of institutional controls to limit future exposure. Select the appropriate PID bag headspace soil sample size(s) for the project given the above criteria. ESSs (as defined in Appendix A) can be used to determine the distribution of contamination within each separate source area (may also be referred to as an area of concern or recognized environmental condition). PID bag headspace CSSs, collected in triplicate, targeting the appropriate depth (based on the CSM, ESS results and exposure scenario) can be used to make risk-based decisions about gasoline contamination within potentially contaminated areas at the site. LS will be based on the number of CSS (1 LS for every 10 CSS).

3. Sampling Methodology

Documentation of the sampling method used must be included with the data in the ESA report. Excavators, backhoes, and hand tools all have the ability to expose relatively large volumes of soil for direct examination and sample collection. However, subsurface soil borings rely on small sample volumes to represent subsurface conditions. Therefore, different sample methodologies are warranted as presented below.

3.1 Hand Tools, Excavator, Backhoe

Triplicate and co-located samples can be selected with more reliability using direct excavation techniques such as test pits than from soil borings. Therefore, the sampling methodology is the same as presented in Appendix A.

3.2 Subsurface Soil Borings

Due to the limitations in sample recovery and direct observation of the subsurface conditions several soil borings may be required to reliably use the field screening procedures to characterize subsurface conditions. The number of soil borings is site specific and depends on the soils present, the size of the area being investigated and the ability of the equipment to recover representative samples. Sample recoveries less then 60% will require alternative methods to use the field screening techniques for making risk-based decisions. Alternative sampling methods may include shortening the sample length to increase soil recovery in a target interval. For example where a 4 foot core barrel is in use, it could be driven and recovered twice to collect 2 two-foot samples over a four-foot interval. Depending on the soil type, this may results in better sample retrieval than attempting to sample all four feet in one run. Another alternative method may include completing multiple borings at a specific location to adequately sample the subsurface when soil recoveries are below 60%. When risk-based decisions or notification level determinations are being based on field methods and soil borings, a minimum of one ESS should be collected for every two feet of boring depth. If significant

changes in contaminant concentrations are observed over a sampled interval then they should be sampled (field screened) separately. In addition a minimum of one CSS should be collected for each risk-based depth criteria (accessible, potentially accessible, and isolated) in accordance with Appendix A. Lastly at least one boring must be sampled per each 500 square feet of potentially contaminated area (AOC, REC, or source area).

4. Documentation

The method of soil sample collection must be documented. Where subsurface soil samples are described on a log (testpit log or boring log) the information must be recorded in a way that documents the stratigraphy and the specific characteristics of the soil sample. For boring logs, the depth interval sampled must be recorded. Additionally, the sample recovery details must be documented, including either the percentage of the target interval actually recovered, or the length of recovery compared to the target length. Collapsed soils recovered in the sample interval must not be included in the percent recovered or in the length of sample recovered. This is often referred to as "wash" from wash and drive drilling methods. Direct push tools that do not utilize dual tube samplers may also experience collapse from coarse grained units.

Field Sampling Procedures for UST Site Assessments at Facility Closure or Tank Abandonment

1.0 Introduction

This section may be used as an alternative soil sampling method to Appendix P of Chapter 691, the Department's Rules for Underground Oil Storage Facilities. Notification levels for the PID Bag Headspace test are given in Table 1. Notification for the oleophillic dye test is any coloration on the ESP bead or the dye is observed in the soil matrix, or in/on the water (may stain the side of the jar) For fuel oil sites both the oleophillic dye test and the PID Bag Headspace test will be required for all CSSs.

2.0 Underground Piping and Dispenser Island areas

For the purpose of this appendix, a piping run and associated dispenser(s) island is treated as one area. One ESS is required for each 5-foot section of underground piping, including the associated piping dispenser island. One CSS is required at all ESS locations that exceed the DEP Notification Level specified in this SOP. If no ESS exceeds the notification level, then the three highest ESS readings shall be selected for CSS collection. One LS shall be required for each 10 CSS collected within each underground piping and dispenser area.

3.0 Under Ground Storage Tank Area

More than one UST may be removed during a tank removal event. If the tanks are located adjacent to one another and the resulting excavation is one continuous excavation, then it can be considered one tank area. If the USTs are not adjacent to one another and the resulting tank excavations have separate excavation side walls, then they shall be treated as separate tank areas.

3.1 Excavation Screening Sampling (ESS)

The ESS are to be collected in a metalized bag and follow the procedures outlined in this SOP. The sampling frequency and documentation of ESS is up to the discretion of the environmental professional responsible for directing the excavation. However, a minimum set of ESS will be collected as follows:

The collection of ESS is separated into specified depth intervals to account for direct contact risks and risks associated with contaminant migration. A minimum of one ESS is required in the top two-feet for each ten-foot section of excavation perimeter. A minimum of one ESS is needed for each 100-square feet of wall exposure (10 x 10) below the two-foot depth. On the floor, a minimum of one ESS shall be collected for each 100-square feet of floor exposure (10 x 10). Keep in mind that due to side wall sloping, the floor exposure is likely to be smaller than the foot print of the excavation.

3.2 Confirmation Screening Samples (CSS)

One CSS is required at all ESS locations that exceed the DEP Notification Level specified in this SOP (see Table 1). If no ESSs exceed the notification level, then the 5 highest ESS reading locations shall be selected for CSS collection.

3.3 Lab Samples (LS)

One LS is needed for each 10 CSS collected within each UST area as defined above. The LS should be co-located with a CSS and sample locations should be clearly documented for future investigators. If less than 10 CSSs are collected, at least 1 LS will be collected.

Appendix B
MEDEP Draft SOP – Field Testing of Soil Samples for Fuel Oils Utilizing Oleophilic Dye Shake Test

DRAFT

COVERSHEET
STANDARD OPERATING PROCEDURE

Operation Title: **FIELD TESTING of SOIL SAMPLES for FUEL OILS UTILIZING OLEOPHILIC DYE SHAKE TEST**

Originator: Deb Stahler
Quality Assurance Chemist
Division of Technical Services
Bureau of Remediation and Waste Management

Standard Operating Procedure: TS005
REVISION: 0
DATE: September 1, 2010
Written/Revised by: Deb Stahler
Reviewed by: Rob Peale

George Seel — Signature — Date
Oil Program Manager

Mark Hyland — Signature — Date
Bureau Director

1.0 PURPOSE

The purpose of this document is to describe the Maine Department of Environmental Protection, Bureau of Remediation and Waste Management (MEDEP/BRWM) procedure for fuel oil field testing of soils using a shake test with an oleophilic dye.

2.0 APPLICABILITY

MEDEP/TS is responsible for the investigation and remediation of petroleum sites throughout Maine. The procedure described herein is a field test for screening soils contaminated with kerosene and fuel oil. It is not applicable for use with heavy crude oils (Bunker C) or bituminous materials like asphalt or waxes. This field method is not adequate for sites where gasoline may be present, but may be used in conjunction with TS004 Field Testing of Soil Samples for Gasoline Utilizing Photoionization Detectors at gasoline or mixed product contaminated sites. This field test is intended to characterize contamination and guide soil excavations. It does not replace laboratory analysis where such analysis is required by the December 1, 2009 Remediation Guidelines for Petroleum Contaminated Sites in Maine.

3.0 RESPONSIBILITES

This procedure applies to all staff in MEDEP/BRWM assigned to perform field testing and/or make remedial decisions for diesel range petroleum sites. Generally, it is the field personnel of BRWM/Technical Services (BRWM/TS), BRWM/Response Services (BRWM/RS) and BRWM/Remediation (BRWM/DR) who will be responsible for performing this task. All BRWM staff must be appropriately trained prior to performing this test for the investigation of gasoline range petroleum sites and training documented in accordance with the LUST Quality Assurance Plan (http://www.maine.gov/dep/rwm/ust/lustqaplan.htm).

The directors of the Divisions of Response Services, Technical Services and Remediation as well as all supervisors in those divisions are responsible for ensuring that staff understand and adhere to these procedures when used for key field decisions or site assessments.

4.0 INTRODUCTION

Suspected petroleum contaminated soil is added to the sample bottle, to which oil-free water is also added and the contents shaken vigorously with a rapidly dissolving red or blue oleophilic dye (Scarlet Red or Indigo Blue).

The oleophilic dye stains petroleum products red (or blue). When petroleum is released from the soil it attaches to an expandable polystyrene (EPS) bead and/or attaches to the walls of the container. Where no visible oil layer is present the bead will turn pink or blue down to the limit of detection which is about 500 ppm.

Soil that remains on-site should be analyzed by the appropriate laboratory analytical method for definitive concentration data.

5.0 PLANNING

As with any sampling event, a sampling and analysis plan (SAP) and a health and safety plan (HASP) should be developed. Guidance for the development of a Sampling and Analysis Plan can be found in DSR's SOP #014 – Development of a Sampling and Analysis Plan (http://www.maine.gov/dep/rwm/sops/index.htm).

Processing one sample will take approximately 15 minutes from initial sample collection through recording results. It is important to plan for someone to complete the sampling and analysis in a careful and timely fashion for results to be useful.

The field sampling approach in Appendix A includes the **minimum** number of field and laboratory samples required at excavations where the data quality objective is to meet the December 1, 2009 Remediation Guidelines for Petroleum Contaminated Sites in Maine.

6.0 EQUIPMENT

The following equipment is required for conducting the procedure:

- Soil sampling equipment such as shovel, bucket auger, soil borer, scoops
- 100 ml plastic sample bottles containing appropriate dyes and EPS bead. Cheiron Resources Ltd. produces several test kits, two of which OilScreenSoil (Scarlet Red)® and OilScreenSoil (Indigo Blue)® have been successfully tested by MEDEP for use according to SOP TS005.
- Oil-free water

7.0 PROCEDURE

7.1. Collect the soil sample, as outlined in the site specific Sampling and Analysis Plan (SAP)(See SOP DR#014 - Development of a Sampling and Analysis Plan) with appropriate soil sampling equipment.

7.2. Perform test as follows:

- Add soil to sample bottle (100 ml plastic sample bottles containing appropriate dyes and EPS bead) to ½ full. Label bottle.
- Add oil free water to sample bottle to ¾ full.
- Shake vigorously until dye cube dissolves (about 30 seconds)
- Allow sample to sit for 10 minutes for color development on bead.
- Use indigo blue dye when results are inconclusive with red dye.

7.3. Results are reported as saturated, positive, slightly positive and negative as described below:

- **saturated** when obvious red (or blue) dye is observed in the soil matrix, or in/on the water (may stain the side of the jar);
- **positive** when only the EPS bead is dyed dark pink/ red or blue and there is no coloration in the soil or water;
- **slightly positive** when only the EPS bead is dyed light pink or blue and there is no coloration in the soil or water; or

- **negative** when there is no coloration in the soil or water and the EPS bead remains white.

See color indicators on page 4.

7.4. Results are interpreted as:

- **Saturated** results indicate cleanup is needed for outdoor commercial/ excavation-construction worker scenarios as described in the Remediation Guidelines for Petroleum Contaminated Sites in Maine.
- **Positive/ slightly positive** result indicates cleanup is needed for resident/ park user scenarios as described in the Remediation Guidelines for Petroleum Contaminated Sites in Maine.
- **Negative** result indicates no cleanup is required unless laboratory results indicate an issue with leaching to groundwater.

Testing performed to date indicates that a negative result will be protective of leaching to groundwater in most cases. Laboratory analyses may be needed to ensure all standards are met. The Department will continue to collect and review results to evaluate whether or not this test may be used to determine when cleanup is needed for leaching to groundwater scenarios.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

This field test is intended to guide soil excavations. It does not replace laboratory analysis for risk assessment. All field tests must be completed and documented according to these written procedures.

The number of field and laboratory samples outlined in Appendix A for excavations where the data quality objective is to meet the December 1, 2009 Remediation Guidelines for Petroleum Contaminated Sites in Maine will be performed (at a minimum).

Additional quality assurance/ quality control tasks may be needed based on the DQO requirements of the project.

10.0 DOCUMENTATION

Field notes should be collected following the standard procedures as outlined in 6.0 of the LUST QAP. When documenting such a sampling event, one should include enough information so that a person at a later date can easily duplicate the sampling and be able to compare the results. Record results on the form provided in Attachment B. Results may alternatively be recorded in the field notebook as long as all information from Attachment B is recorded.

As this type of screening is done in the field by the sampling team conducting the sampling, no chain of custody is required.

Color Indicators

Field Sampling Approach

This procedure is intended to be used at soil removals and excavations where the data quality objective is to meet the December 1, 2009 Remediation Guidelines for Petroleum Contaminated Sites in Maine. The basis of this approach is that field samples will be used to direct soil excavation and confirm that field screening objectives are met prior to collecting laboratory samples. The following approach should be followed when termination of excavation is based on field screening. It is understood that there are other reasons for terminating an excavation and those reasons should be documented for future investigators.

This approach uses three types of samples as defined below. The sample type definitions are provided to help clarify what is meant by terms used in this document.

Excavation Screening Samples (ESS). These are field screened samples (using this SOP) that are collected to help direct the soil excavation. These samples may represent soils that are removed during an excavation because they exceed the field screening guidelines, or they may represent soils that remain in place.

Confirmation Screening Samples (CSS). These are field screened samples (using this SOP) that are collected at the termination of the excavation and represent soils that remain in place.

Laboratory Samples (LS). These are lab samples that are collected at the termination of the excavation and represent soils that remain in place. They are collected at a rate of 1 - LS per 10- CSS samples. Please remember, you can collect as many excavation screening samples as you need to help direct the excavation without collecting any LS samples. However, once you have reached the limits of the excavation and CSS samples are collected, then a minimum of one laboratory sample will be collected for each ten CSS collected. The LS sample or samples should be co-located with the corresponding CSS location or locations.

Sample Frequency

Field Screening Sampling Frequency

The sampling frequency of Excavation Screening Samples is up to the discretion of the environmental professional responsible for directing the excavation. Once the environmental professional determines that sufficient soils have been removed, confirmation screening samples should be collected to document the decision to terminate excavation.

Confirmation Screening Samples (CSS)

The collection of CSS is separated into two depth intervals based on the USEPA definition of surface soils (top 2-feet) and subsurface soils (below 2-feet). The top two feet represents that greatest potential direct contact and ingestion risk. Therefore, samples are required for determining the risks in the upper two feet .

Top Two Feet of Excavation

A minimum of one CSS is required in the top two-feet for each ten-foot section of excavation exposure. The excavation exposure is the total perimeter distance of the excavation.

Below Two Feet of Excavation

A minimum of one CSS is required for every ten foot square section of excavation exposure below the two-foot depth.

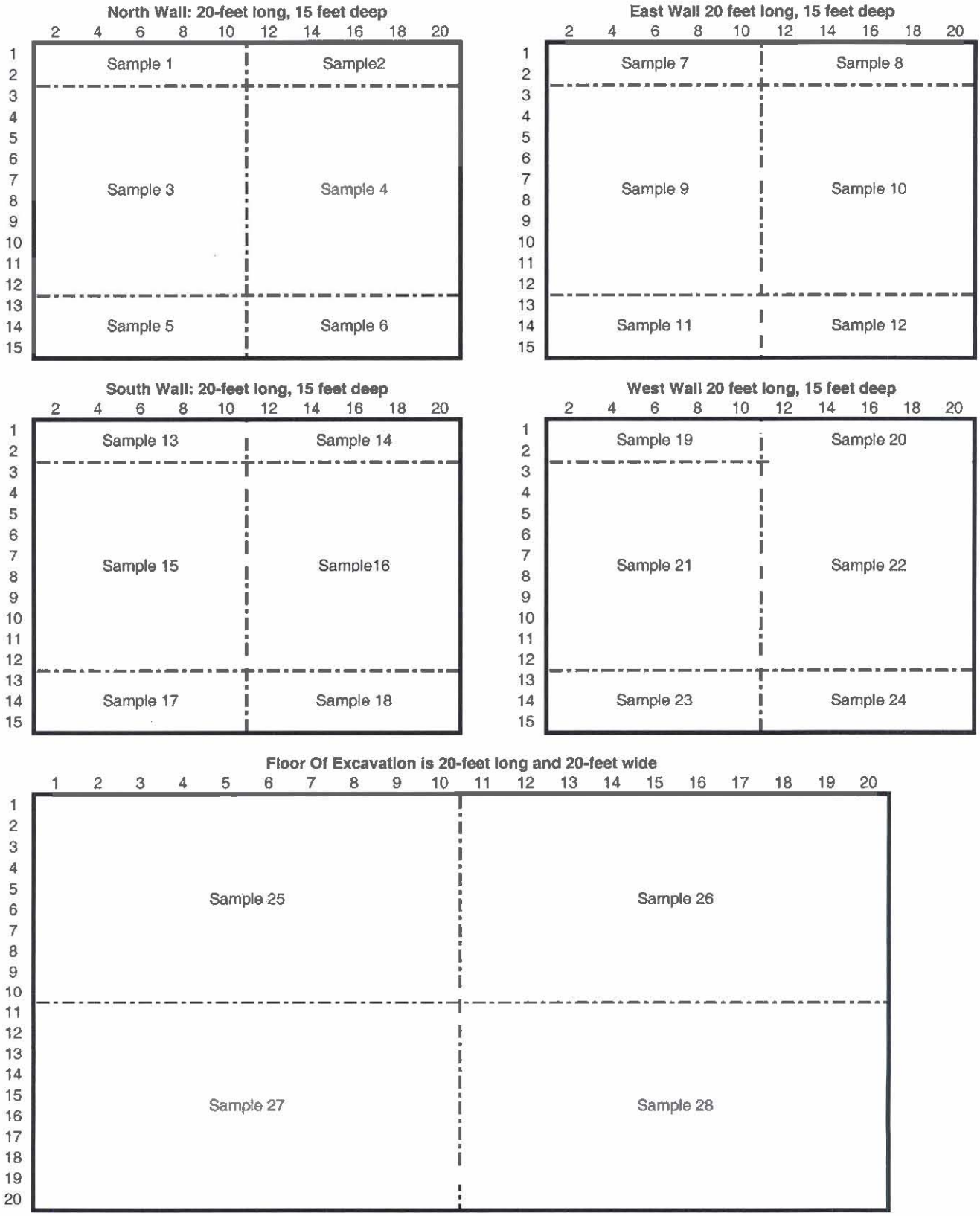
Floor Sampling

On the floor, a minimum of one CSS sample shall be collected for each 100-square feet of floor exposure (10 x 10). Keep in mind that due to side wall sloping the floor exposure is likely to be smaller than the foot print of the excavation.

Example

An excavation oriented North-South that is 20-feet long, 20-feet wide, and 15-feet deep represents a removal of approximately 222 cubic yards (Figure 1). The perimeter measures 80-feet and the walls are vertical to keep things simple. This excavation would require a minimum of 28 CCS locations as shown below. The 28 samples included: eight CSS samples from 0-2 feet, eight Samples from 2-12 feet, eight Samples from 12-15 Feet, and four samples from the floor. This example would require a minimum of 3 laboratory samples.

Appendix A Figure 1
Excavation Example



TS005 Appendix B
Field Documentation Sheet

Site Name/ Spill #:					Shake Test Operators:
Town:					Date:
Ambient Temperature:					Weather:
Write Sample ID and indicate result with and X					
Sample ID	S	P	SP	N	Soil Type/Comments/Observations

S = Saturated- obvious red (or blue) dye is observed in the soil matrix, or in/on the water (may stain the side of the jar)
P = Positive- the EPS bead is dyed dark pink/ red or blue and there is no coloration in the soil or water
SP = Slightly Positive- the EPS bead is dyed light pink or blue and there is no coloration in the soil or water
N = Negative - No observations of dye coloration on EPS bead, soil, or water